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NATIONAL DAM SAFETY PROGRAM. BEAR SWAMP LAKE DAM NUMBER 2 (NJ00--ETC(U)
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1 of 2
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LEVEL II

PASSAIC RIVER BASIN

BEAR SWAMP BROOK, PASSAIC COUNTY

NEW JERSEY

BEAR SWAMP LAKE
DAM NO. 2

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

See backpage for #1473

NJ 00029

DEPARTMENT OF THE ARMY
PHILADELPHIA DISTRICT, CORPS OF ENGINEERS
CUSTOM HOUSE - 2D & CHESTNUT STREETS
PHILADELPHIA, PENNSYLVANIA 19106

AUGUST 1978

DEPARTMENT OF THE ARMY
PHILADELPHIA DISTRICT, CORPS OF ENGINEERS
CUSTOM HOUSE—2D & CHESTNUT STREETS
PHILADELPHIA, PENNSYLVANIA 19106

IN REPLY REFER TO
NAPEN-D

Honorable Brendan T. Byrne
Governor of New Jersey
Trenton, New Jersey 08621

26 SEP 1978

Dear Governor Byrne:

Inclosed is the Phase I Inspection Report for Bear Swamp Lake Dam No. 2 in Passaic County, New Jersey which has been prepared under authorization of the Dam Inspection Act, Public Law 92-367. A brief assessment of the dam's condition is given in the front of the report.

Based on visual inspection, available records, calculations and past operational performance, Bear Swamp Lake Dam No. 2, initially listed as a high hazard potential structure but reduced to a significant hazard potential structure as a result of this inspection, is judged to be in good overall condition. The spillway is in good overall condition. The spillway is considered inadequate since 35 percent of the Probable Maximum Flood (PMF) would overtop the dam. To insure adequacy of the structure, the following actions, as a minimum, are recommended:

a. The adequacy of the spillway should be determined by a qualified professional consultant, engaged by the owner, using more sophisticated methods, procedures and studies within six months from the date of approval of this report. Any remedial measures necessary to insure the adequacy of the spillway and to prevent overtopping should be initiated within calendar year 1979.

b. The dam should be surveyed and as-built drawings should be made within 6 months of the date of approval of this report.

c. Within one year from the date of approval of this report, the following actions should be taken.

(1) Brush and vines growing on the downstream face, and rotted vegetation at the toe should be removed and kept cleaned away.

(2) Areas of deteriorated, spalled or seriously cracked concrete should be cleaned and patched annually to prevent progressive damage.

(3) The owner should initiate a program of annual inspections of the dam, utilizing the standard visual check list in this report. A permanent log should be kept of all maintenance and operating events of the dam and lake.

A copy of the report is being furnished to Mr. Dirk C. Hofman, New Jersey Department of Environmental Protection, the designated State Office contact for this program. Within five days of the date of this letter, a copy will also be sent to Congressman Robert A. Roe of the Eighth District. Under the provisions of the Freedom of Information Act, the inspection report will be subject to release by this office, upon request five days after the date of this letter.

Additional copies of this report may be obtained from the National Technical Information Services (NTIS), Springfield, Virginia, 22161 at a reasonable cost. Please allow four to six weeks from the date of this letter for NTIS to have copies of the report available.

An important aspect of the Dam Safety Program will be the implementation of the recommendations made as a result of the inspection. We accordingly request that we be advised of proposed actions taken by the State to implement our recommendations.

Sincerely yours,

1 Incl
As stated

JOEL T. CALLAHAN
Lieutenant Colonel, Corps of Engineers
Acting District Engineer

Cy furn:
Mr. Dirk C. Hofman, P.E., Deputy Director
Division of Water Resources
N. J. Dept. of Environmental Protection
P.O. Box 2809
Trenton, NJ 08625

BEAR SWAMP LAKE DAM NO. 2 (NJ00029)

CORPS OF ENGINEERS ASSESSMENT OF GENERAL CONDITIONS

This dam was inspected on 27 June and 6 July 1978 by Harris-ECI under contract to the State of New Jersey. The state, under agreement with the U.S. Army Engineeer District, Philadelphia, had this inspection performed in accordance with the National Dam Inspection Act, Public Law 92-367.

The Bear Swamp Lake Dam No. 2, initially listed as a high hazard potential structure but reduced to a significant hazard potential structure as a result of this inspection, is judged to be in good overall condition. The spillway is in good overall condition. The spillway is considered inadequate since 35 percent of the Probable Maximum Flood (PMF) would overtop the dam. To insure adequacy of the structure, the following actions, as a minimum, are recommended:

a. The adequacy of the spillway should be determined by a qualified professional consultant, engaged by the owner, using more sophisticated methods, procedures and studies within six months from the date of approval of this report. Any remedial measures necessary to insure the adequacy of the spillway and to prevent overtopping should be initiated within calendar year 1979.

b. The dam should be surveyed and as-built drawings should be made within 6 months of the date of approval of this report.

c. Within one year from the date of approval of this report, the following actions should be taken.

(1) Brush and vines growing on the downstream face, and rotted vegetation at the toe should be removed and kept cleaned away.

(2) Areas of deteriorated, spalled or seriously cracked concrete should be cleaned and patched annually to prevent progressive damage.

(3) The owner should initiate a program of annual inspections of the dam, utilizing the standard visual check list in this report. A permanent log should be kept of all maintenance and operating events of the dam and lake.

DATE: 26 September 1978 APPROVED: Joel Callahan

JOEL T. CALLAHAN
Lieutenant Colonel, Corps of Engineers
Acting District Engineer

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PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

Name of Dam:	Bear Swamp Lake Dam #2, I.D. NJ00029
State Located:	New Jersey
County Located:	Passaic
Stream:	Bear Swamp Brook
Date of Inspection:	June 27, and July 6, 1978

Assessment of General Condition

The general condition of Bear Swamp Lake Dam #2 is good.

The general safety of Bear Swamp Lake Dam #2 is considered questionable in view of its lack of spillway capacity to pass the PMF, or even one-half of the PMF without overtopping the dam, even though overtopping of the dam would have little effect since the abutments and foundation are massive unweathered rock.

At present the engineering data available is not sufficient to make a definitive statement on the stability of the dam, however, in view of past performances of the dam, its present condition, and in light of stability calculations performed, collection of engineering data is not necessary.

The following remedial actions, however, are suggested along with a timetable for their completion.

1. Studies to augment the spillway discharge capacity should be undertaken within six months.

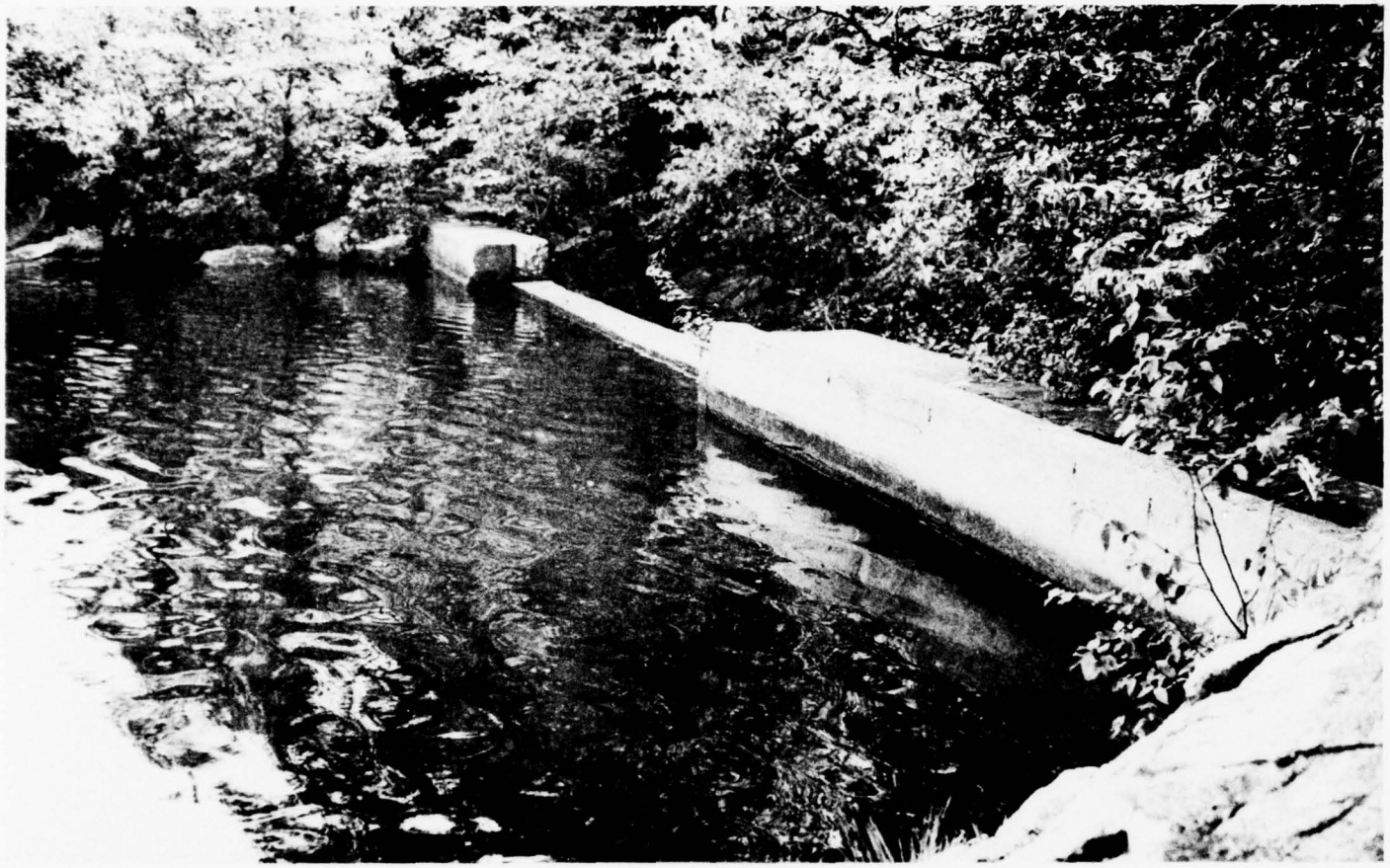
2. The dam should be surveyed and as-built set of plans and drawings should be completed within a 6 month period.

Furthermore, while of a less urgent nature, the following additional action is recommended and should be carried out within a reasonable period of time.

1. Brush and vines growing on the downstream face, and rotted vegetation at the toe should be removed and kept cleaned away. The downstream face should be seeded with grass to prevent erosion.

2. Areas or deteriorated, spalled or seriously cracked concrete should be cleaned and patched annually to prevent progressive damage.

Robert Gershowitz, P.E.



BEAR SWAMP DAM #2

June 27, 1978

View of dam and abuments from upstream right abutment.

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PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

BEAR SWAMP LAKE DAM #2, ID. NJ00029

SECTION 1: PROJECT INFORMATION

1.1 General

a. Authority

The National Dam Inspection Act (Public Law 92-367, 1972) provides for the National Inventory and Inspection Program by the U.S. Army Corps of Engineers. This inspection was made in accordance with this authority under Contract C-FPM No. 35 with the State of New Jersey who, in turn, is contracted to the Philadelphia District of the Corps of Engineers.

b. Purpose of Inspection

The visual inspection of the Bear Swamp Lake Dam #2 was made on June 27, and July 6, 1978. The purpose of the inspection was to make a general assessment as to the structural integrity and operational adequacy of the dam structure and its appurtenances.

c. Scope of Report

This report summarizes available pertinent data relating to the project; presents a summary of visual observations made during the Field Inspection; presents an evaluation of hydrologic and hydraulic conditions at the site; presents an evaluation as to the structural adequacy of the various project features; and assesses the general condition of the dam with respect to safety.

1.2 Description of Project

a. Description of Dam and Appurtenances

Bear Swamp Lake Dam #2 is a mass concrete structure with a maximum height of about 17.5 feet. Section dimensions were obtained by field measurements. The crest width is 2.75 feet. The maximum section occurs at the spillway which drops about 6.5 feet to a concrete apron. The apron is "V" shaped and inclined to the discharge channel. Ground surface is considerably higher on both sides of the spillway with a height of about 3.5 feet for the sections on each side of the spillway. While no actual measurements were made to define the cross section it can be reasonably assumed that the section is the same as for Bear Swamp Lake Dam #1. Based on that assumption, the upstream face slopes back at 1 horizontal to 4 vertical; downstream face is vertical from the crest for the first 2 feet, then slopes outward 1 horizontal to 1.5 vertical. The dam axis is straight. The total length of the dam is 68.5 feet. Freeboard at the time of the inspection was about 1.3 feet.

Two concrete walls function as saddle dikes between rock outcrops in the right abutment. The wall nearest to the dam is 11 feet long, 16 inches high and 33 inches wide. The farthest is 27 feet long, 2 feet 8 inches high and 33 inches wide. These dikes were not considered when computing the spillway capacity.

Bedrock outcrops occur in both abutments and it is believed that the dam is founded on bedrock.

The spillway is a broad-crested rectangular weir 29 feet wide and 16 inches deep. Energy from spillway discharges is dissipated over a concrete apron, previously described.

On the right side of the spillway there is a concrete valve chamber which extends approximately 5 feet below ground level and contains two gate valves. The larger valve is approximately 12 inches in diameter and the smaller approximately 6 inches in diameter, based on a visual examination. The 12-inch diameter gate valve is a non-rising stem type manually operated by a handwheel. This valve controls the flow through a 12 inch line which runs from the lake, beneath the dam, and discharges into the outlet channel at the end of the spillway. This valve is the one the caretaker normally uses if the lake level must be lowered for any reason. The purpose of the 6 inch valve is unknown.

A plunge pool, about 10 feet in diameter, lies at the toe of the spillway apron. The discharge channel is a poorly defined natural, rocky creek bed. There is heavy vegetation, trees and debris in the immediate area of the channel. Side slopes are moderate to steep and rocky with tree growth.

b. Location

Bear Swamp Lake Dam #2 is located in Passaic County, New Jersey. It is accessible from Carmantown Road by way of Crabtree Road. The damsite is surrounded by private property.

c. Size and Hazard Classification

Bear Swamp Lake Dam #2 is classified in the dam size category as being "intermediate", since its storage is less than 50,000 acre-feet, but may be slightly more than 1,000 acre-feet. Its size classification based on height is "small" since its height is less than 40 feet. Since failure of the dam is not likely to cause extensive loss of life or excessive property damage, a hazard potential classification of "significant" has been assigned to the project. The dam was initially rated "high" hazard, but was downgraded after the field inspection revealed that overtopping of the dam would cause little damage downstream.

d. Ownership

Bear Swamp Lake Dam #2 is owned by the Lake Arcadia Association, Otterhole Road, West Milford, New Jersey, 07480; Attention: Mr. James A. Hosford, Chairman.

e. Purpose of Dam

The lake is used only for recreation, mostly swimming, boating and fishing.

f. Design and Construction History

The dam was constructed around 1926, on what is now the western side of Bear Swamp Lake. No original drawings of the dam were available. No computations for the design of the original structure were available. No records were available of the construction of the dam or any repairs that were made to the structure after original construction.

g. Normal Operational Procedures

The discharge from the lake is normally unregulated, however, the water level in the lake is very stable. It was reported that the water level is lowered 15 to 18 inches each fall, usually in late October. The water level is allowed to return to its normal level each spring.

1.3 Pertinent Data

a. Drainage Area - 0.40 square miles

b. Discharge at Damsite

Maximum known flood at damsite	N.A.
Warm water outlet at pool elevation	N.A.
Diversion tunnel low pool outlet at pool elevation	N.A.
Diversion tunnel outlet at pool elevation	N.A.
Gated spillway capacity at pool elevation	N.A.
Gated spillway capacity at maximum pool elevation	N.A.

Ungated spillway capacity at maximum pool elevation	142 cfs
Total spillway capacity at maximum pool elevation	142 cfs

c. Elevation (Feet above MSL)

Top of dam	886.33
Maximum pool-design surcharge	886.33
Full flood control pool	N.A.
Recreation pool	885
Spillway crest	885
Upstream portal invert diversion tunnel	N.A.
Downstream portal invert diversion tunnel	N.A.
Streambed at centerline of dam	870 $\pm$
Maximum tailwater	N.A.

d. Reservoir

Length of maximum pool	3,650 feet (Estimated)
Length of recreation pool	3,590 feet (Estimated)
Length of flood control pool	N.A.

e. Storage (Acre-Feet)

Recreation pool	900 acre-feet (El. 885)
Flood control pool	N.A.
Design surcharge	1,000 acre-feet (El. 886.33)
Top of dam	1,000 acre-feet (El. 886.33)

f. Reservoir Surface (Acres)

Top of dam	86.4 acres (El. 886.33)
Maximum pool	86.4 acres (El. 886.33)
Flood control pool	N.A.
Recreation pool	64 acres (El. 885)
Spillway crest	64 acres (El. 885)

g. Dam

Type	Straight Concrete Gravity
Length	68.5 feet
Height	17.5 feet
Top width	2.75 feet
Side slopes - Upstream	1 horizontal to 4 vertical
- Downstream	1 horizontal to 1-1/2 vertical
Zoning	N.A.
Impervious core	N.A.
Cutoff	N.A.
Grout curtain	None

h. Diversion and Regulating Tunnel (N.A.)

i. Spillway

Type	Overflow
Length of weir	29 feet

Crest elevation	885 feet
Gates	N.A.
Upstream channel	Bear Swamp Lake
Downstream channel	Bear Swamp Brook

j. Regulating Outlets

12-inch diameter conduit controlled by 12-inch gate valve.

SECTION 2: ENGINEERING DATA

2.1 Design

No drawings or computations pertaining to original construction, modification or repair of the dam could be found. No foundation borehole or geologic investigation data could be found. The design strength for the mass concrete is unknown.

2.2 Construction

No records have been found and the owner's representative has no knowledge of the construction history of the dam.

2.3 Operation

No records of operation of the lake are kept by the owner. The only operating rule is to lower the lake each fall to protect boat docks during the winter. Otherwise, the lake is allowed to operate naturally without regulation.

2.4 Evaluation

a. Availability

No engineering data was available for the original section or the repairs to the dam.

b. Adequacy

While the engineering data was insufficient to perform a comprehensive, definitive evaluation of the dam's stability, an adequate assessment of the dam could be carried out with the data obtained in the field in view of the overall good condition of the dam.

c. Validity

Not applicable, as no design or construction records were available.

SECTION 3: VISUAL INSPECTION

3.1 Findings

a. General

The visual inspection made of Bear Swamp Lake Dam #2 did not reveal any signs of distress in the dam. The dam appeared to be in reasonably good condition with minimally adequate maintenance.

b. Dam

Some deep spalling has occurred at the toe of the section to the left of the spillway. Some leakage was visible in this area. A large horizontal crack has occurred in the section to the right of the spillway. No leakage was apparent in this location. Minor frost spalling has occurred on the upstream face. Construction joints appeared to be tight. There were no indications of either horizontal or vertical movement of the structure.

The foundation for the dam and two saddle dikes is a massive gneiss. Joint spacing of foliation planes ($N5^{o}$-$15^{o}E$, dip $35^{o}SSE$) exceed 3 feet. Two cross joint sets at right angles to each other and the foliation are relatively tight and are spaced about 2 feet apart. Rock outcrops rim the reservoir.

Concrete to rock abutment contacts appeared to be excellent.

The two walls which act as saddle dikes appeared to be in good condition.

c. Appurtenant Structures

Spillway

A structural crack has occurred through the spillway about 10 feet from the right side. Leakage in the order of 0.5 g.p.m. was observed in this area. Some minor leakage was also observed from two horizontal construction joints in the spillway. No serious cracking was observed in the spillway apron.

Low Level Outlet

A concrete valve vault is located at the toe of the downstream side of the dam to the right of the spillway. A 12-inch diameter cast iron pipe extends from the valve chamber to a point of discharge under the toe of the spillway apron. The valve chamber contains two valves. The large valve is approximately 12 inches in diameter and the smaller approximately 6 inches in diameter. These are estimates made by observations of the size of the valve bonnets, since the main bodies of both valves are buried in mud and debris which has collected in the valve chamber. The data normally provided right on the casting is no longer legible due to corrosion. The 12-inch diameter gate valve is a non-rising stem type manually operated by a handwheel. This

valve controls the flow through a 12 inch line which runs from the lake, beneath the dam.

This valve is the one the caretaker normally uses if the lake level must be lowered for any reason, and he demonstrated the operation of the valve for this inspection. The valve functions quite satisfactorily.

As mentioned above, there is a second gate valve, approximately 6 inches in diameter, located in this valve box. However, the caretaker did not know what purpose this valve served. He had never operated the valve in his three years at the lake.

d. Reservoir Area

The reservoir rim is gently sloped and no indications of instability were readily apparent. The slopes above the reservoir are heavily wooded. No buildings or dwellings are built on or near the shoreline, with only a few boat docks on the shoreline. The property around the lake is privately owned and it was reported that access to the lake is limited to members of the Lake Arcadia Association.

e. Downstream Channel

A plunge pool, about 10 feet in diameter, lies at the toe of the spillway apron. The discharge channel is a poorly defined natural, rocky creek bed. There is heavy vegetation, trees and debris in the immediate area of the channel.

Side slopes are moderate to steep and rocky with tree growth.

3.2 Evaluation

Based on the visual inspection the dam appears to be functioning adequately. Some maintenance is in order and recommendations are presented in subsequent sections. The impoundment slopes show no apparent signs of instability and are not believed a potential hazard to the dam.

SECTION 4: OPERATIONAL PROCEDURES

4.1 Procedures

Bear Swamp Lake Dam #2 is used to impound water for recreation activities. The strategy is to maintain a nearly constant lake level. The lake level is normally maintained by unregulated discharge over the spillway.

The lake level is lowered each fall by releasing water through the outlet pipe in Bear Swamp Lake Dam #2. The lake is usually lowered about 15 to 18 inches below the normal level during the winter and is allowed to refill naturally in the early spring.

4.2 Maintenance of the Dam

There is no program of regular inspection and maintenance of the dam and appurtenant structures. Operation and maintenance is done by Mr. James Corter, caretaker for the Lake Arcadia Association, as a part of his duties. At present, no records of operation and maintenance are kept.

4.3 Maintenance of Operating Facilities

The 12-inch low level outlet gate valve is operated annually by Mr. Corter. The purpose of the 6-inch valve is unknown. The outlet pipe has not received maintenance.

4.4 Evaluation

Surveillance and maintenance is in the hands of the Lake Arcadia Association caretaker. A formalized program of periodic inspection by an experienced party in dam operations should be initiated and documentation recorded to assist the owner.

SECTION 5: HYDRAULIC/HYDROLOGIC

5.1 Evaluation of Features

a. Design

The drainage area above Bear Swamp Lake Dam #1 and #2 is approximately 0.40 square miles. The drainage area was delineated from U.S.G.S. topographic maps. There are two dams which impound water in the Bear Swamp Lake; one is located at the south end of the lake, named Bear Swamp Lake Dam #1 and the other is located to the northwest of Dam #1 and is named Bear Swamp Lake Dam #2. A drainage map of the watershed of Bear Swamp Lake Dams #1 and #2 is presented on Plate 1, Appendix D. Both the Bear Swamp Lake Dam #1 and Dam #2 are located in the same reservoir. However, the spillway is located on Bear Swamp Lake Dam #2.

The topography within the basin varies from foothills type terrain in the southeast section to generally hilly in the northwest section. Elevations range from approximately 1,040 feet above mean sea level in the hills at the east end of the watershed to about 880 feet at the damsite.

The land use pattern within the watershed is mostly forest. The forested lands are along the hilly sections of the watershed. About twenty percent of the watershed area is the reservoir of the dam.

The evaluation of the hydraulic and hydrologic features of the dam was based on criteria set forth in the Corps of Engineers' Recommended Guidelines for Safety Inspection of Dams, and additional guidance provided by the Philadelphia District, Corps of Engineers. The Probable Maximum Flood (PMF) was calculated from the Probable Maximum Precipitation (PMP) using Hydrometeorological Report No. 33 with standard reduction factors. Due to the small drainage area of Bear Swamp Lake Dam #2, the SCS triangular hydrograph, transformed to a curvilinear hydrograph, was adopted for developing the unit hydrograph. The derived unit hydrograph is presented under the section of hydrologic computations.

Initial and infiltration loss rates were applied using SCS procedure to the PMP to obtain rainfall excesses. The rainfall excesses were then applied to the unit hydrograph to obtain the PMF hydrograph utilizing the Corps of Engineers' computer program HEC-1. The computed peak discharges of the PMF and one-half of the PMF are 2,379 cfs and 1,189 cfs, respectively.

Both the PMF and one-half the PMF inflow hydrographs were routed through the reservoir by the Modified Puls Method, utilizing the same computer program HEC-1. The spillway and overtop discharge rating curve of Bear Swamp Lake Dam #2 were combined with overtop discharge rating curve of Bear Swamp Lake Dam #1 for the flood routing. The peak outflow discharges for the PMF and one-half the PMF for the two dams are 1,586 cfs and 365 cfs, respectively. Both the PMF and one-half the PMF result in overtopping of both Dam #1 and Dam #2.

The spillway and overtop discharge rating curves of the dams were prepared assuming free overflow across the whole length of the dams and the spillway. The reservoir stage-capacity data were based on the U.S.G.S. quadrangle topographic maps in combination with data given in the National Dam Safety Inventory Table. Reservoir storage capacity included for surcharge levels exceeds the top of the dam. The overtop discharge rating curve of Dam #1, the spillway and overtop discharge rating curve of Dam #2, and the combined spillway and overtop discharge rating curves of both the dams were prepared assuming the dams remain intact during routing. In the routing computations, the discharge through outlet facilities of the dams was excluded due to its insignificant magnitude as compared to the PMF. The overtop discharge rating curves of Dam #1, the spillway and overtop discharge rating curve of Dam #2, and the combined spillway and overtop discharge rating curves of the two dams are presented in Plates 2, 2A and 2B. The reservoir capacity curve is also presented in Plate 3 of Appendix D.

b. Experience Data

No records of lake levels are maintained for this site. The lake level is normally stable and no reports or evidence was found that the dam has ever been overtopped.

c. Visual Observations

The valley below the dam is heavily wooded with much debris. There are few dwellings downstream of the dam along the periphery of Heroin Pond but no new urbanization is found in the Bear Swamp lake area. The slopes around the lake are gently sloping and heavily wooded. There is little evidence of sedimentation in the lake.

d. Overtopping Potential

As indicated in Section 5.1-a., both the Probable Maximum Flood and one-half of the Probable Maximum Flood, when routed through the Bear Swamp Lake reservoir result in overtopping of Dam #1 and Dam #2. The PMF and one-half the PMF overtopped Dam #2 by 1.07 feet and 0.32 feet, respectively. In determining the overtopping heights it was assumed that both the dams remain in their present condition, such that outflow occurs over both the dams during the floods, according to the existing structural dimensions of the dams. Since one-half of the PMF is the minimum Spillway Design Flood (SDF) for this dam, according to the Recommended Guidelines for Safety Inspection of Dams by the Corps of Engineers, the spillway capacity of the Bear Swamp Lake Dam #2 is considered inadequate.

e. Reservoir Drawdown

The reservoir drawdown below the spillway crest, elevation 885, is accomplished by permitting discharge simulataneously through the 8-inch tile pipe under Dam #1 and the 12-inch cast iron pipe under Dam #2. The hydraulic calculations were performed by assuming invert elevations and dimensions as shown on the calculation sheets presented in Appendix D. The tailwater was assumed to correspond to the top of the conduit and kept constant at that level for the purpose of drawdown calculation. This resulted in a maximum head differential of 13.67 feet for the outlet pipe in Dam #1 and 15.67 feet for the outlet pipe in Dam #2. Assuming a constant inflow of 0.80 cfs (2 cfs/sq. mi.), the total drawdown time is 39 days and 6 hours, at which point the reservoir pool is at elevation 870.33 feet. Assuming zero inflow, the drawdown to elevation 870.33 can be accomplished in 35 days and 7 hours.

SECTION 6: STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability

a. Visual Observations

At the time of the inspection the dam did not exhibit any visible signs of distress. There was no evidence of tilting, misalignment or movement on the foundation. The dam appears to be founded on competent rock. The surface spalling and deterioration of concrete does not affect the structural strength or stability. Based on a visual inspection, and in view of more than 50 years of satisfactory past performance, the structure appears to be stable.

b. Design and Construction Data

No design or construction data was available.

c. Operating Records

No operating records were available.

d. Post-Construction Changes

No post-construction changes.

e. Static Stability

The depth to the base of concrete, as well as the shape and dimensions of the section, and the nature and strength parameters of the foundation will profoundly influence the stability of the dam. Also, ice loads during the winter could be significant, depending on the climate and reservoir restraint. None of this information is presently available. Therefore, it is not possible to make a definitive statement on the stability of the concrete section.

f. Seismic Stability

A north-south trending fault about 2/3 mile east of the dam has been mapped by others. The dam is located in Seismic Zone 1, as defined in Recommended Guidelines For Safety Inspection of Dams as prepared by the Corps of Engineers. In general, project located in Seismic Zones 0, 1 and 2 may be assumed to present no hazard from earthquake, provided the static stability conditions are satisfactory and conventional safety margins exist.

SECTION 7: ASSESSMENT/REMEDIAL MEASURES

7.1 Dam Assessment

a. Safety

The dam has been inspection visually and a review has been made of the available engineering data. This assessment is subject to the limitations inherent in the visual inspection procedures stipulated by the Corps of Engineers for Phase I Reports.

The safety of Bear Swamp Lake Dam #2 is in question because there is inadequate capacity in the spillway to pass the PMF or one-half the PMF flood without overtopping both dams. However, overtopping the dams should cause only minor damage since the abutments and foundation are massive unweathered rock. The present spillway of Bear Swamp Lake Dam #2 can pass only about 34 percent of the PMF.

No definitive statement pertaining to the safety of the structure can be made without determination of the complete dimensions of the dam and acquisition of the engineering properties of the foundation. However, the present dam has performed adequately since it was built in 1926, without failure or evidence of instability.

b. Adequacy of Information

The information and data uncovered is not adequate to perform a comprehensive, definitive evaluation of the dam's stability. Nevertheless, in view of the past performance of the dam, its present condition, and in light of stability calculations performed, it is not felt that additional information on the engineering properties of the embankment and foundation is necessary at this time. Nevertheless, it is believed desirable to have a survey of the dam made to determine and prepare drawings of the true shape and dimensions of the dam structure.

c. Urgency

Studies to augment the spillway discharge capacity should be made within six months, and a plan formulation should be completed within a 12-month period.

The as-built set of dam plans and drawings should be completed within a 6 month period.

7.2 Remedial Measures

a. Alternatives

The alternatives available for increasing the spillway capacity are:

1. Increasing the dam height, of both Bear Swamp Lake Dams, thus, permitting a higher discharge to pass over the Bear Swamp Lake Dam #2 without overtopping.

2. Providing for a spillway on the Bear Swamp Lake Dam #1 by notching the crest, adding a chute on the downstream face, hardening the toe area below the spillway and constructing a protected downstream discharge channel, all sufficient to withstand emergency flows of one-half PMF magnitude.

3. Increase the spillway capacity at Bear Swamp Lake Dam #2.

4. A combination of the above alternatives.

It must be emphasized that both dams must be modified at the same time for alternatives involving raising the dam.

b. O & M Procedures

The owner should initiate a program of annual inspections of the dam, utilizing the standard visual check list in this report.

A permanent log should be kept of all maintenance and operating events of the dam and lake.

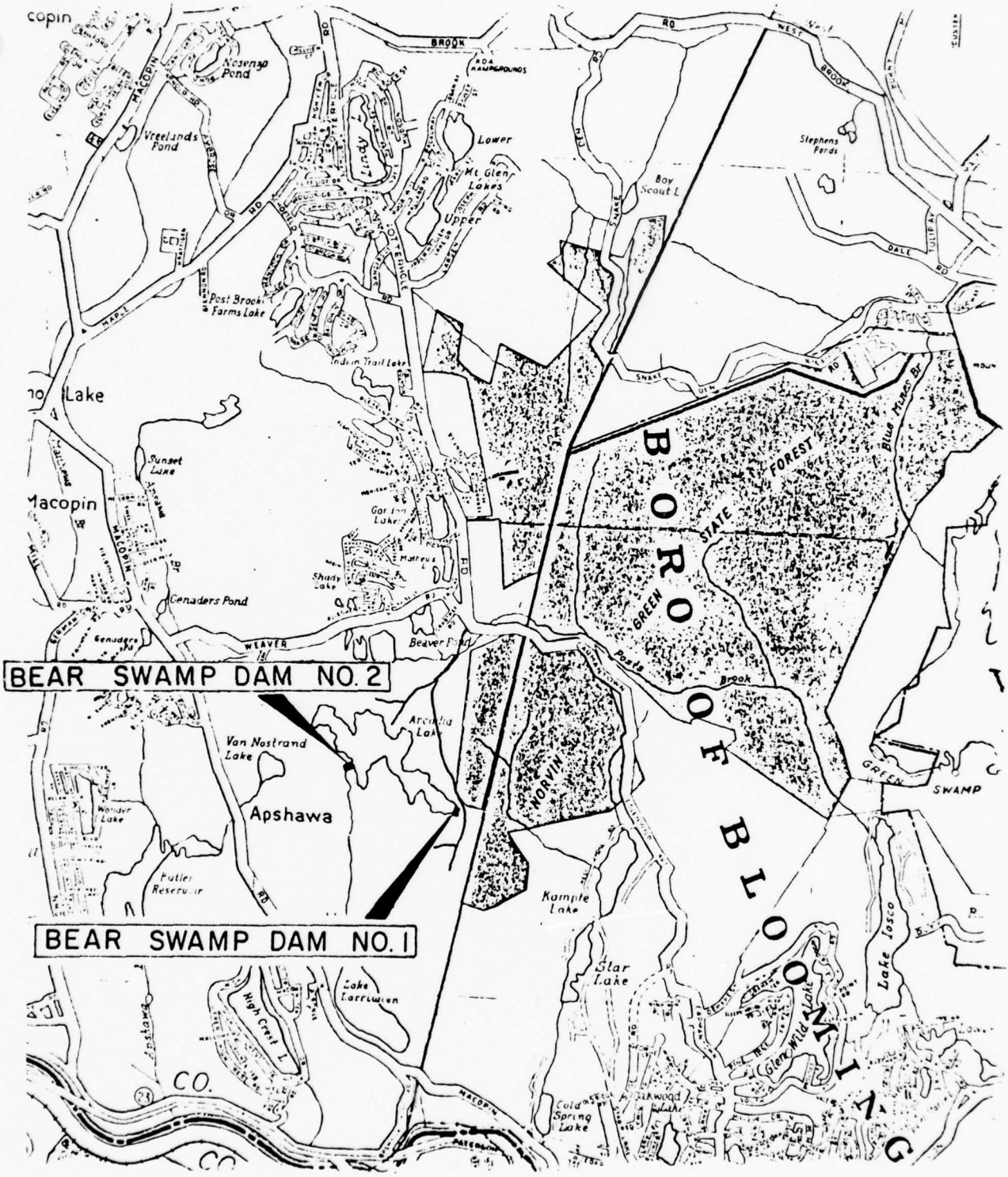
7.3 Recommendations

Based on the visual inspection and data evaluation presented herein, the following action is recommended.

Brush and vines growing on the downstream face, and rotted vegetation at the toe should be removed and kept cleaned away.

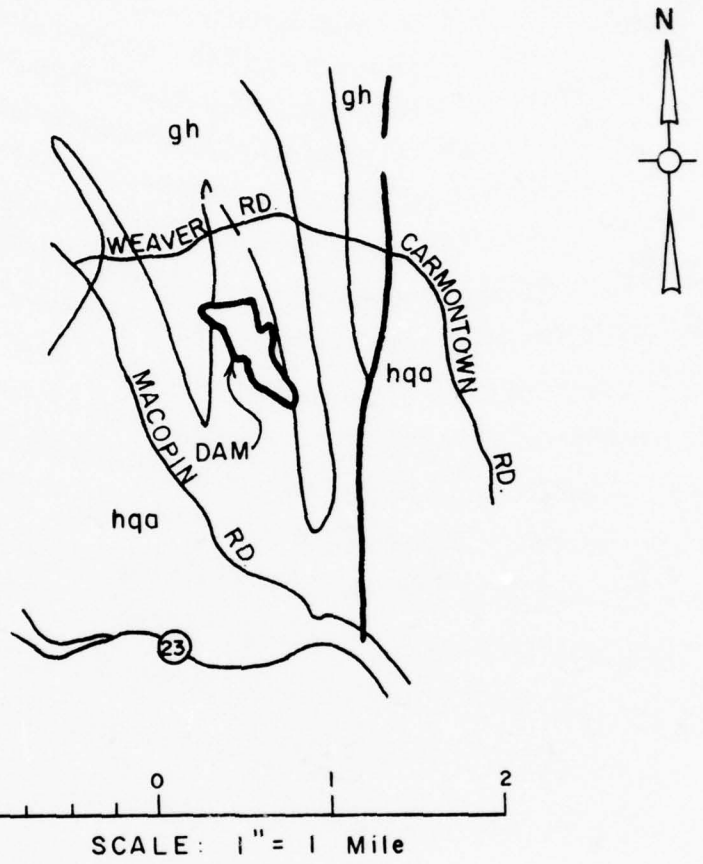
Areas of deteriorated, spalled or seriously cracked concrete should be cleaned and patched annually to prevent progressive damage.

PLATES



VICINITY MAP

PLATE 1

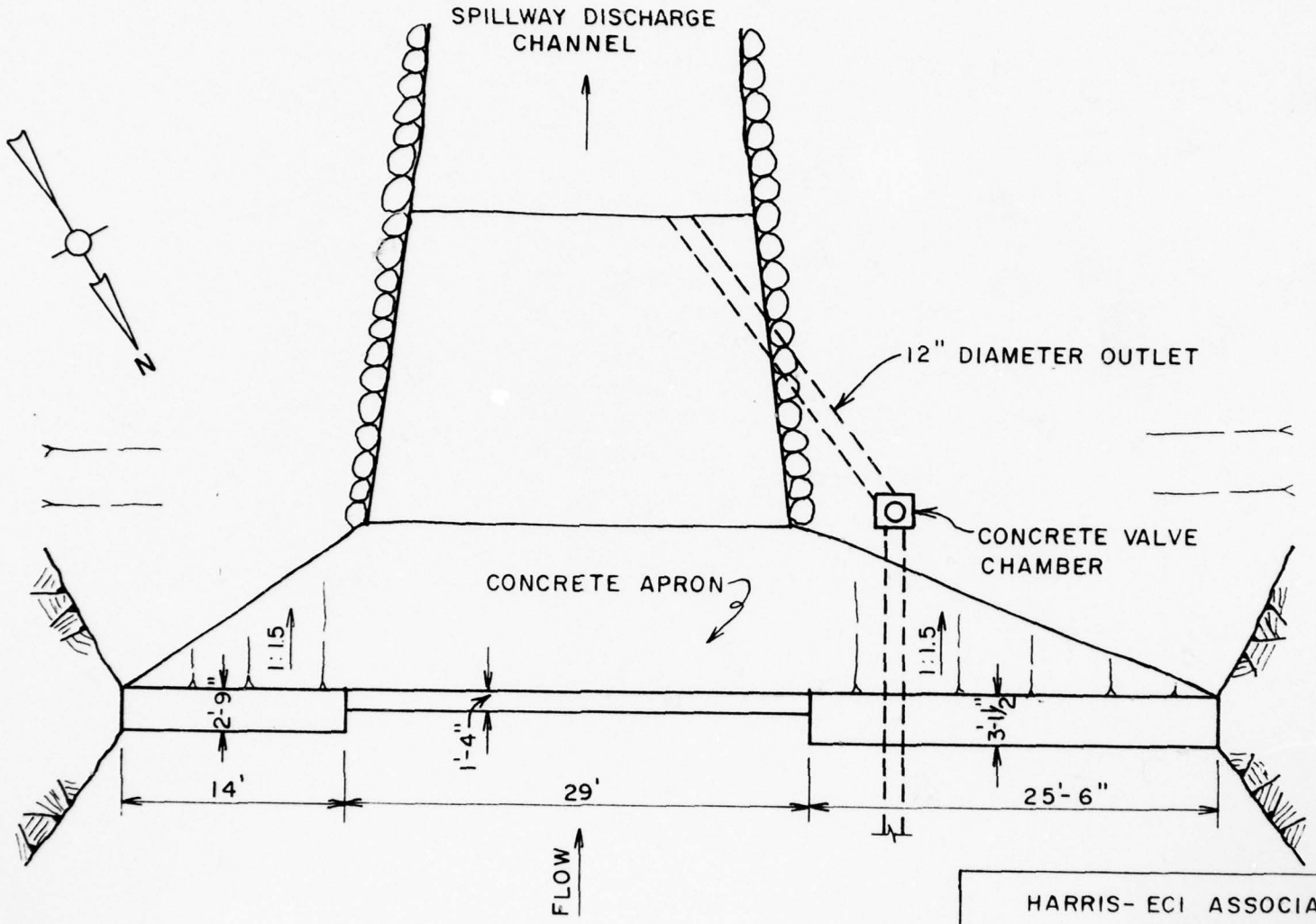


LEGEND

gh	MOSTLY HORNBLENDE GRANITE AND GNEISS
hqa	HYPERSTHENE - QUARTZ - ANDESINE GNEISS

GEOLOGIC MAP
BEAR SWAMP DAM NO. 2

PLATE 2



GENERAL PLAN

PLATE 3

HARRIS- ECI ASSOCIATES		
BEAR SWAMP LAKE DAM # 2 GENERAL PLAN		
FIELD INSPECTION SKETCH		
D.J.K.	6-27-78	1 OF 1

APPENDIX A

CHECK LIST - VISUAL OBSERVATIONS

CHECK LIST - ENGINEERING, CONSTRUCTION
MAINTENANCE DATA

CHECK LIST

Visual Inspection
Phase I

Name Dam Bear Swamp #2 County Passaic State New Jersey Coordinators _____

Date(s) Inspection June 27, 1978 Weather Cool-Clear Temperature 75°F
Rained the previous night.

Pool Elevation at Time of Inspection _____ M.S.L. Tailwater at Time of Inspection _____ M.S.L.
W.S. 16 inches below concrete crest.

Inspection Personnel:

(June 27, 1978)	(July 6, 1978)	(July 6, 1978)
Joe Sirianni	Yin Au-Yeung	Wm. Flynn
Henry King	Lynn Brown	
David Kerkes		

Robert B. Campbell Recorder

Owner Representative:

(June 27, 1978)

James Carter, Caretaker
Lake Arcadia Association

CONCRETE/MASONRY DAMS

Type - Straight Concrete Gravity Dam

Bear Swamp #2

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SEEPAGE OR LEAKAGE	Leakage through structural crack in spillway-trickle leak estimated to be about 1/2 gpm. Two small trickle leaks through horizontal construction joints (too small to estimate flow). No evidence of seepage can be seen downstream of the dam.	Repair reservoir face of dam by 6 inch slab method used in past or other suitable waterproofing method to minimize seepage through dam.
STRUCTURE TO ABUTMENT/EMBANKMENT JUNCTIONS	Both abutments are bedrock with no evidence of past erosion. Contact between concrete and rock foundation appears good.	
DRAINS	None - N.A.	
WATER PASSAGES	See Outlet Works.	
FOUNDATION	Leaves and rotted vegetation have piled up at the downstream toe apparently causing minor deterioration of concrete surface above contact between concrete and rock.	Rotting leaves and vegetation should be cleaned away from toe of dam annually. Surface spalls and deteriorated concrete should be removed and surfaces repaired.

CONCRETE/MASONRY DAMS

Bear Swamp #2

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS CONCRETE SURFACES	Moderately rough due to weathering. Some deep spalling at toe on left abutment. Hairline shrinkage cracks on top of crest parapet.	Inspect dam annually to detect new seepages and/or spalled areas. Apply face slabs or other waterproofing to upstream face whenever new seepages are found.
STRUCTURAL CRACKING	Through crack exists in overflow spillway section about 10 feet from right side of spillway. Trickle leak through crack. Too small to estimate flow.	Repair crack on upstream face to stop flow through crack. See above.
VERTICAL AND HORIZONTAL ALIGNMENT	No evidence of movement is apparent.	
MONOLITH JOINTS	No monolith joints can be identified.	
CONSTRUCTION JOINTS	All construction joints are tight.	

EMBANKMENT

Bear Swamp #2

Type - None

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	N.A.	
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	N.A.	
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	N.A.	
VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST	N.A.	
RIPRAP FAILURES	N.A.	

EMBANKMENT

Bear Swamp #2

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	N.A.	
ANY NOTICEABLE SEEPAGE	N.A.	
STAFF AND GAGE RECORDER	N.A.	
DRAINS	N.A.	

OUTLET WORKS

Bear Swamp #2

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	Outlet is 12 inch C.I. pipe through concrete dam.	
INTAKE STRUCTURE	Submerged and not visible. Can not be inspected. Believed to be none.	
OUTLET STRUCTURE	Submerged open discharge into spillway plunge pool.	
OUTLET CHANNEL	Same as spillway.	
EMERGENCY GATE	None.	

UNGATED SPILLWAY

Bear Swamp #2

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE WEIR	Broad crested wier. Spillway has had an overlay slab installed many years ago. Concrete surface rough and some spalling.	
APPROACH CHANNEL	None - Full reservoir approach.	
DISCHARGE CHANNEL	Fill concrete apron immediately below spillway. Natural meandering waterway. Heavily wooded with much debris. Small plunge pool about 10' diameter at end of spillway apron, apparently man-made for outlet pipe discharge.	
BRIDGE AND PIERS	None.	

GATED SPILLWAY

(None)

Bear Swamp #2

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE SILL	N.A.	
APPROACH CHANNEL	N.A.	
DISCHARGE CHANNEL	N.A.	
BRIDGE AND PIERS	N.A.	
GATES AND OPERATION EQUIPMENT	N.A.	

INSTRUMENTATION

Bear Swamp #2

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
MONUMENTATION/SURVEYS	None	
OBSERVATION WELLS	None	
WEIRS	None	
PIEZOMETERS	None	
OTHER	None	

RESERVOIR

Bear Swamp #2

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	Slopes are stable and gently sloping away from lake	
SEDIMENTATION	Not much sediment inflow. Lake has no inlet stream and is reported by caretaker to be mostly spring fed. No evidence of sedimentation found.	
SHORELINE STRUCTURES	Few residences in area and all 10 or more feet above reservoir level except one just below and on left abutment of Bear Swamp #1 dam.	
USE	Recreation -- Mostly boating and fishing.	
OPERATION	Water level is held very uniform through summer. Reservoir drawn down 15 to 18 inches each fall, usually late October.	

DOWNSTREAM CHANNEL

Bear Swamp #2

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	Heavily wooded meandering rocky creek bed. Much debris.	
SLOPES	Very rocky creek channel with moderate to steep rocky side-slopes. Creek bed is steep. All slopes appear stable.	
APPROXIMATE NUMBER OF HOMES AND POPULATION	No dwellings or structures between Bear Swamp Lake and next lake downstream.	

CHECK LIST
ENGINEERING DATA

DESIGN, CONSTRUCTION, OPERATION

Bear Swamp #2

ITEM	REMARKS
PLAN OF DAM	None available.
REGIONAL VICINITY MAP	Available.
CONSTRUCTION HISTORY	None available. Owner's representative reported the dam was built in about 1926.
TYPICAL SECTIONS OF DAM	None available.
HYDROLOGIC/HYDRAULIC DATA	None available.
OUTLETS - PLAN	)
- DETAILS	) None Available.
- CONSTRAINTS	)
- DISCHARGE RATINGS	)
RAINFALL/RESERVOIR RECORDS	None Available.

CHECK LIST
ENGINEERING DATA

DESIGN, CONSTRUCTION, OPERATION
(Continued)

Bear Swamp #2

ITEM	REMARKS
DESIGN REPORTS	None available.
GEOLOGY REPORTS	None available.
DESIGN COMPUTATIONS HYDROLOGY & HYDRAULICS DAM STABILITY SEEPAGE STUDIES	None available.
MATERIALS INVESTIGATIONS BORING RECORDS LABORATORY FIELD	None available.
POST-CONSTRUCTION SURVEYS OF DAM	None available.
BORROW SOURCES	Unknown.
SPILLWAY - PLAN - SECTIONS - DETAILS	None available.

CHECK LIST
ENGINEERING DATA

DESIGN, CONSTRUCTION, OPERATION
(Continued)

Bear Swamp #2

ITEM	REMARKS
OPERATING EQUIPMENT PLANS AND DETAILS	None available.
MONITORING SYSTEMS	None available.
MODIFICATIONS	None.
HIGH POOL RECORDS	None available.
POST-CONSTRUCTION ENGINEERING STUDIES AND REPORTS	None available.
PRIOR ACCIDENTS OR FAILURE OF DAM - DESCRIPTION - REPORTS	No reports of accidents or failure were found during the investigation.
MAINTENANCE, OPERATION RECORDS	None available.

APPENDIX B

PHOTOGRAPHS

All photos were taken on June 27, 1978.

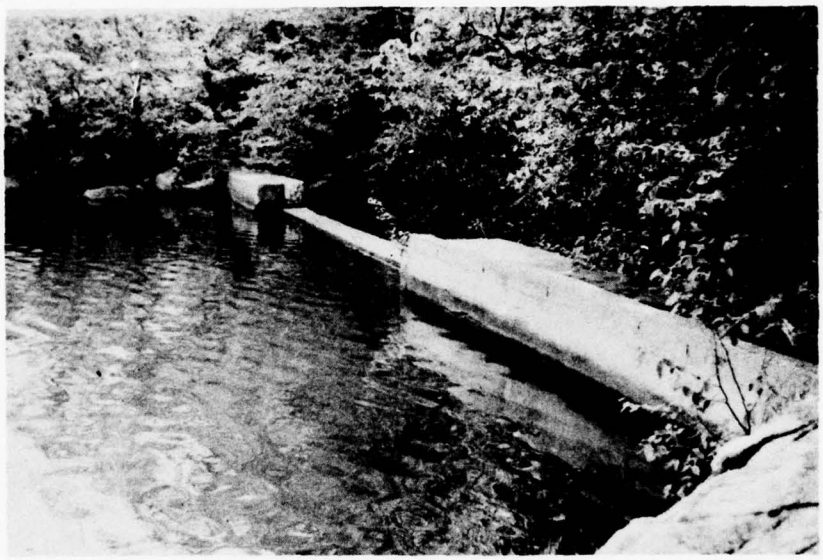


Photo 1 - View of dam and abutments from upstream right abutment.

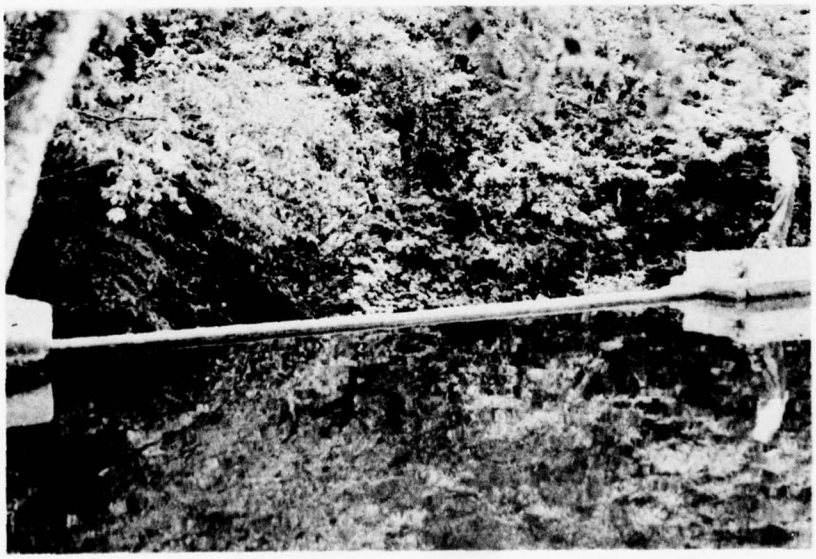


Photo 2 - View of spillway from upstream left shoreline.

Photo 3 - View of dam and spillway from downstream showing concrete apron and plunge pool below spillway.

Photo 4 - View of spillway and apron. Low level outlet is submerged in plunge pool below apron at bottom of photo.

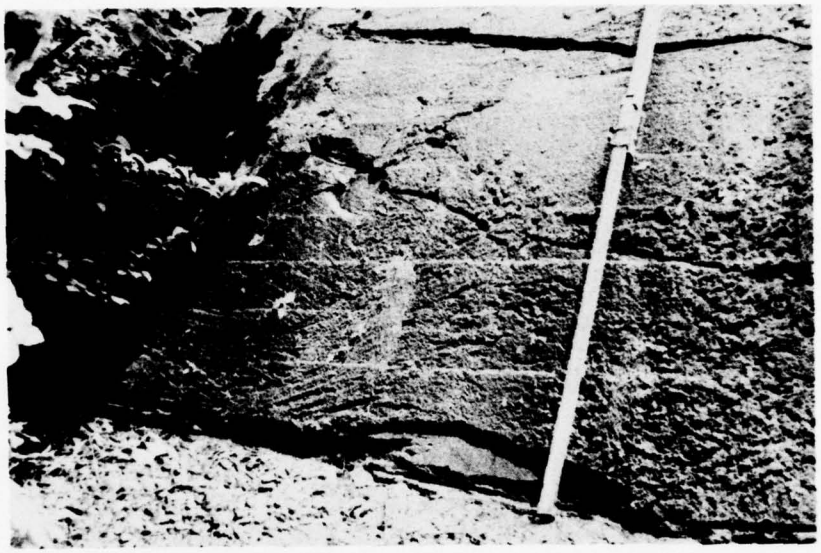


Photo 5 - Leakage and spalled surface on spillway right side.

Photo 6 - Leakage through crack in spillway left side.

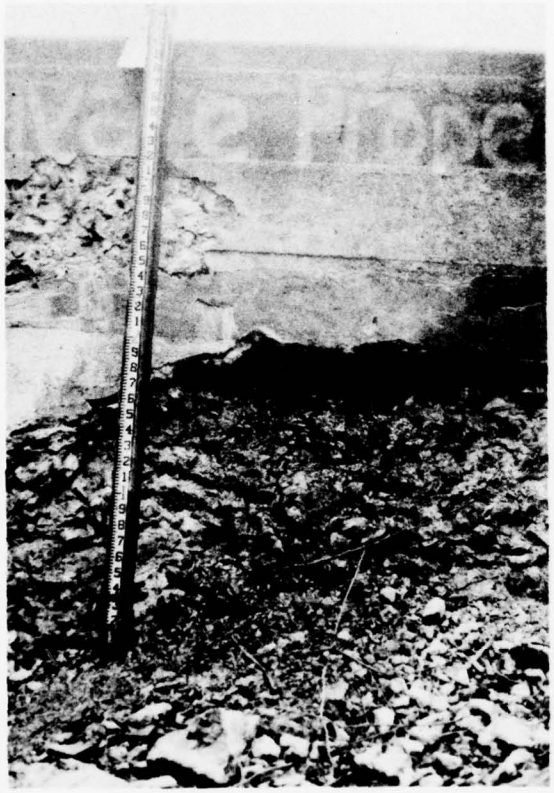


Photo 7 - Spalling and leakage near left abutment.

Photo 8 - Horizontal crack right side near abutment.

Photo 9 - Concrete valve vault for low level outlet pipe.

Photo 10 - View of downstream discharge channel.

Photo 11 - View of downstream discharge channel.

Photo 12 - View of downstream discharge channel.

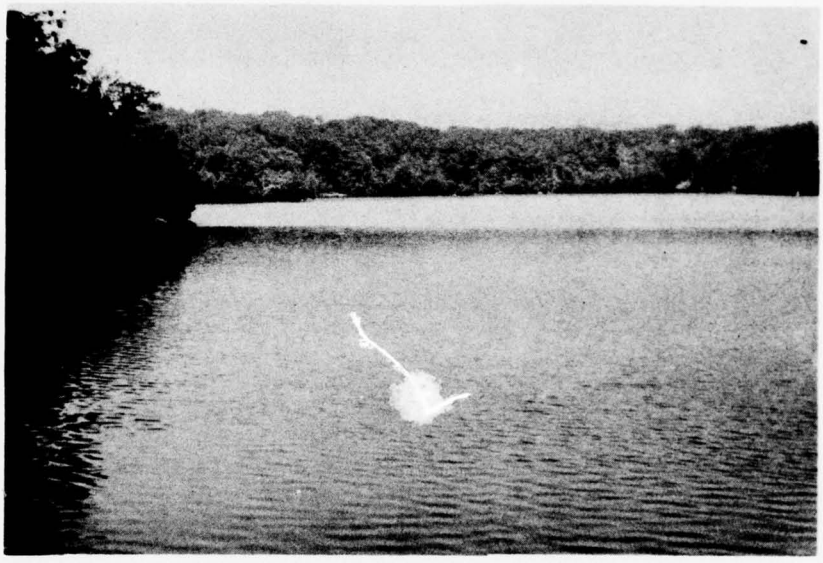


Photo 13 - Bear Swamp Lake and right shoreline.

APPENDIX C

SUMMARY OF ENGINEERING DATA

CHECK LIST

HYDROLOGIC AND HYDRAULIC DATA

ENGINEERING DATA

Name of Dam: Bear Swamp Lake Dam #2

Drainage Area: 0.40 square miles

Elevation Top Normal Pool (Storage Capacity): 885 (900 AF)

Elevation Top Flood Control Pool (Storage Capacity): N.A.

Elevation Maximum Design Pool: 886.33

Elevation Top of Dam: 886.33

SPILLWAY CREST:

a. Elevation: 885

b. Type: Overflow

c. Width: 16 inches

d. Length: 29 feet

e. Location Spillover: Mid-section of the dam

f. Number and Type of Gates: None

OUTLET WORKS:

a. Type: One 6-inch diameter conduit (operation condition unknown), One 12-inch diameter conduit (operable)

b. Location: Right side of the spillway

c. Entrance Inverts: N.A.

d. Exit Inverts: N.A.

e. Emergency Draindown Facilities: Flow through the 12-inch outlet is controlled by 12-inch diameter gate valve

HYDROMETEOROLOGICAL GAGES: (N.A.)

a. Type:

b. Location:

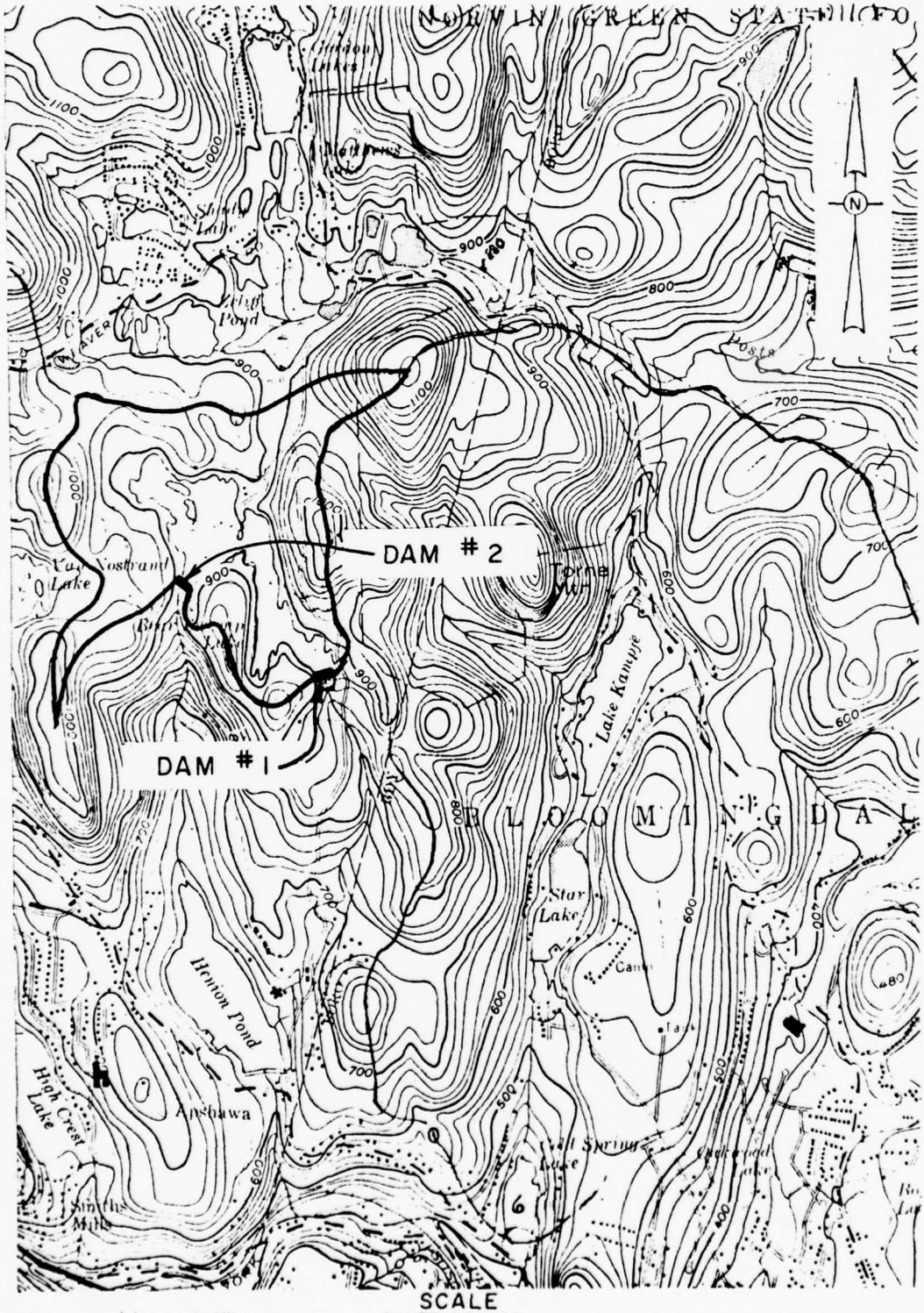
c. Records:

MAXIMUM NON-DAMAGING DISCHARGE: 142 cfs (Estimated)

APPENDIX D

HYDROLOGIC COMPUTATIONS

PLATE I APPENDIX D



SCALE

1 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 FEET

1 5 0 1 KILOMETER

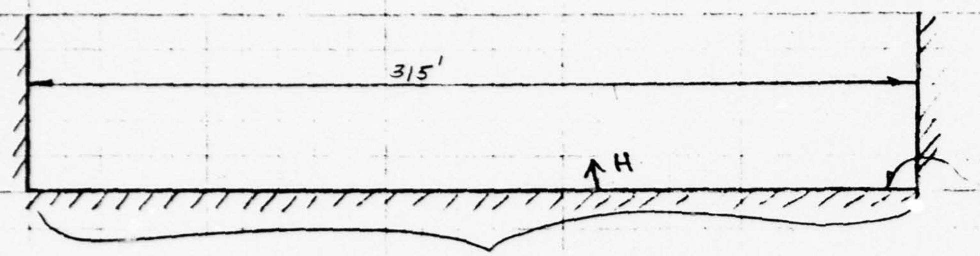
BEAR SWAMP LAKE DAMS #1 & #2
DRAINAGE MAP

ECI-4 **ENGINEERING CONSULTANTS, INC.**

NEW JERSEY (STATE) DAM SAFETY INSPECTION — SHEET NO. ____ OF ____

BEAR SWAMP LAKE DAM I — JOB NO. 1212-001

OVERTOP RATING CURVE — BY ______ DATE ______

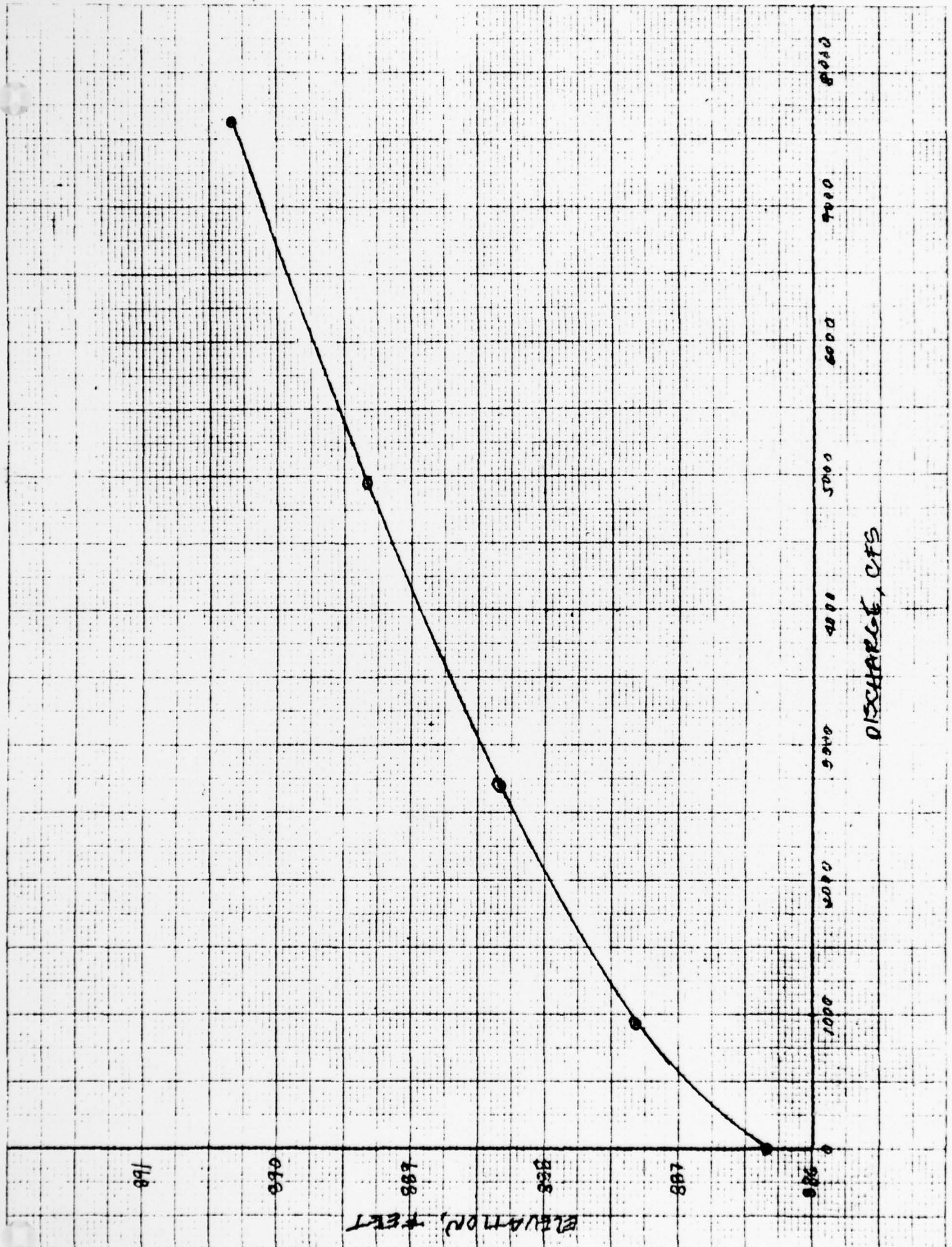


ASSUMED ELEVATION
= 886.33 Ft

ASSUME BROAD CRESTED WEIR
C = 3.03

ELEV. (MSL) (Assumed)	H ft	L ft	C	$Q = CLH^{1.5}$ cfs
886.33	0			0
887.33	1	315	3.03	954
888.33	2	315	3.03	2700
889.33	3	315	3.03	4959
890.33	4	315	3.03	7636

PLATE 2, APPENDIX D



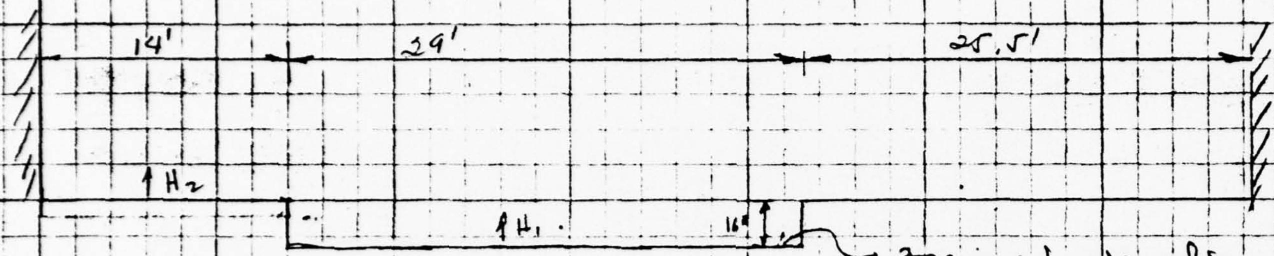
BEAR SWAMP LAKE DAM 1
OVERTOP DISCHARGE RATING CURVE

ECI-4 **ENGINEERING CONSULTANTS, INC.**

NEW JERSEY (STATE) DAM SAFETY INSPECTION — SHEET NO. 1 OF ____

BEAR SWAMP LAKE DAM #2 — JOB NO. 1212-007.

SPILLWAY & OVERTOP RATING CURVE — BY MAB — DATE 7-18-78

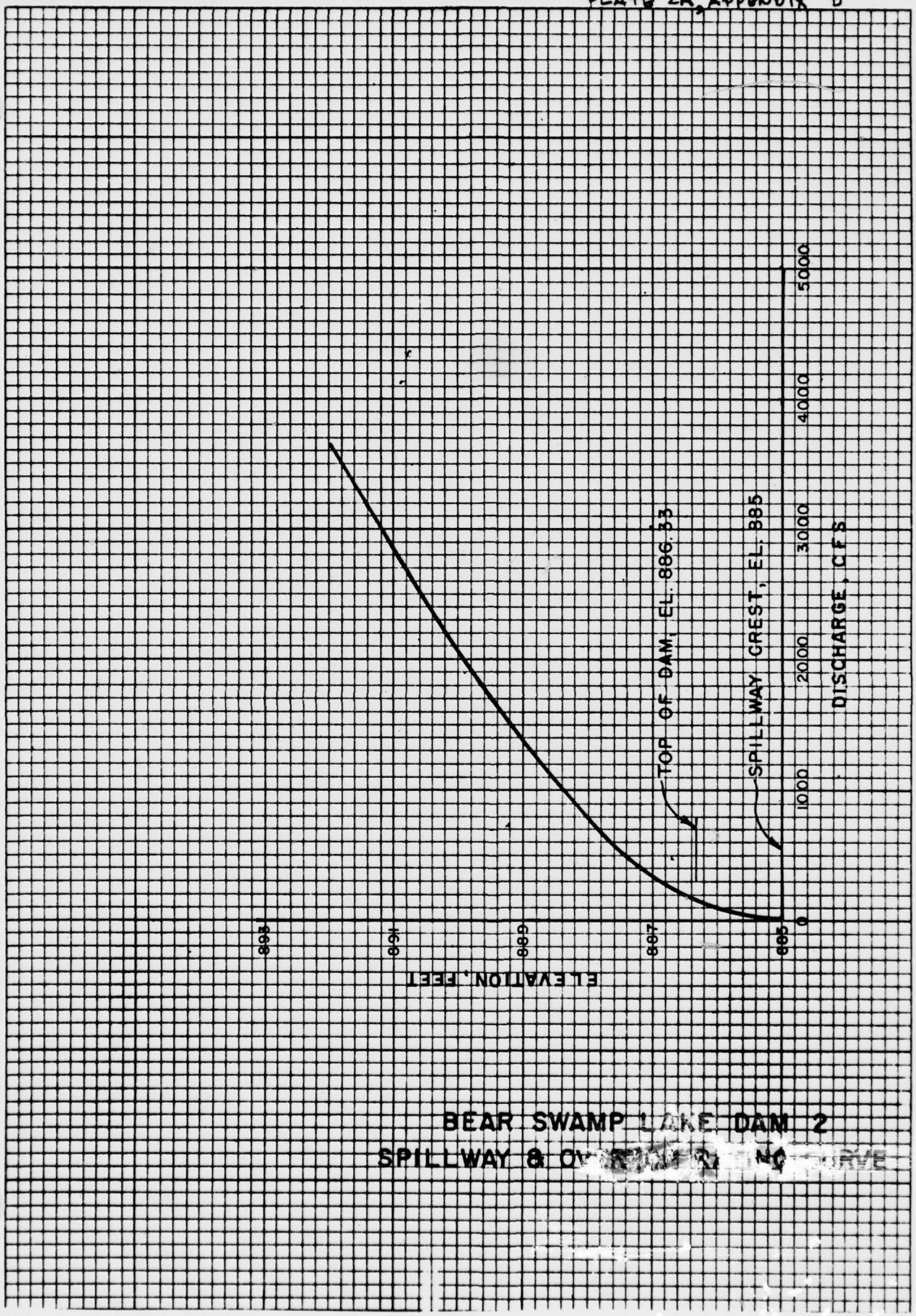


$L_1 = 29'$, $L_2 = 14 + 25.5 = 39.5'$

ELEV. (MSL) Assumed Feet	HEAD on Masonry Weir Crest, Ft.	H_1	H_2	L_1	L_2*	C_1	C_2	$Q = \sum_{i=1}^{2} C_i L_i H_i^{1.5}$
885?	0	0	0					0
886	1	1	0	29		3.2		93
886.33	1.33	1.33	0	29		3.2		142
887	2	2	.67	29	39.5	3.4	3.03	345
888	3	3	1.67	29	39.5	3.6	3.03	800
889	4	4	2.67	29	39.5	3.7	3.03	1380
890	5	5	3.67	29	39.5	3.8	3.03	2073
891	6	6	4.67	29	39.5	3.8	3.03	2828
892	7	7	5.67	29	39.5	3.8	3.03	3657

* The saddles were not taken into consideration.

PLATE 2A, APPENDIX D



BEAR SWAMP LAKE DAM 2

SPILLWAY & OV[illegible] NO[illegible]RVE

ECI-4 **ENGINEERING CONSULTANTS, INC.**

NEW JERSEY (STATE) DAM SAFETY INSPECTION — SHEET NO. 1 OF ____
BEAR SWAMP LAKE #1, #2 — JOB NO. 12/2-001-1
COMBINED SPILLWAY & OVERTOP RATING CURVE — BY MAB DATE 8/81

BEAR SWAMP LAKE DAM #1&2

COMBINED SPILLWAY & OVERTOP RATING CURVE

Assumed ELEV (FT)	DAM #1 DISCHARGE (CFS)	DAM #2 DISCHARGE (CFS)	TOTAL DISCHARGE (CFS)
885.00 (SPILLWAY CREST of Dam #2)	0.0	0.0	0.0
885.50	0.0	40.0	40.0
886.00	0.0	90.0	90.0
886.25	0.0	135.0	135.0
886.33 (TOP OF DAM)	0.0	150.0	150.0
886.50	20.0	190.0	210.0
887.00	560.0	350.0	910.0
888.00	2075.0	800.0	2875.0
889.00	4150.0	1400.0	5550.0
890.00	6720.0	2080.0	8800.0

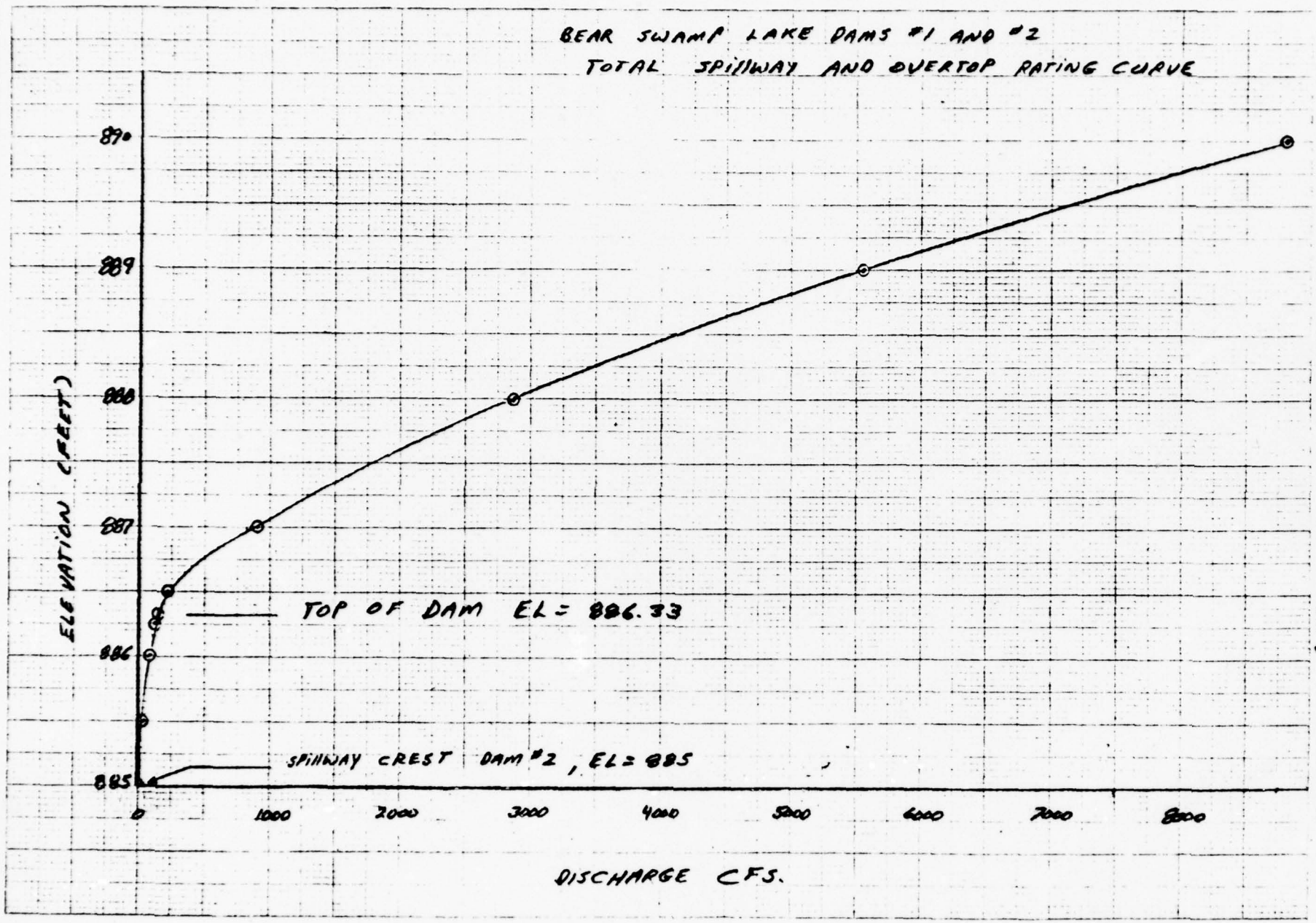


PLATE 2B, APPENDIX D

I-4 ENGINEERING CONSULTANTS, INC.

NEW JERSEY (STATE) DAM SAFETY INSPECTION — SHEET NO. 1 OF
BEAR SWAMP LAKE DAM # 1&2 — JOB NO. 1212-001
RESERVOIR AREA CAPACITY DATA — BY MAS DATE 7-27-78

(4)

BEAR SWAMP LAKE DAM # 1&2

RESERVOIR AREA CAPACITY DATA

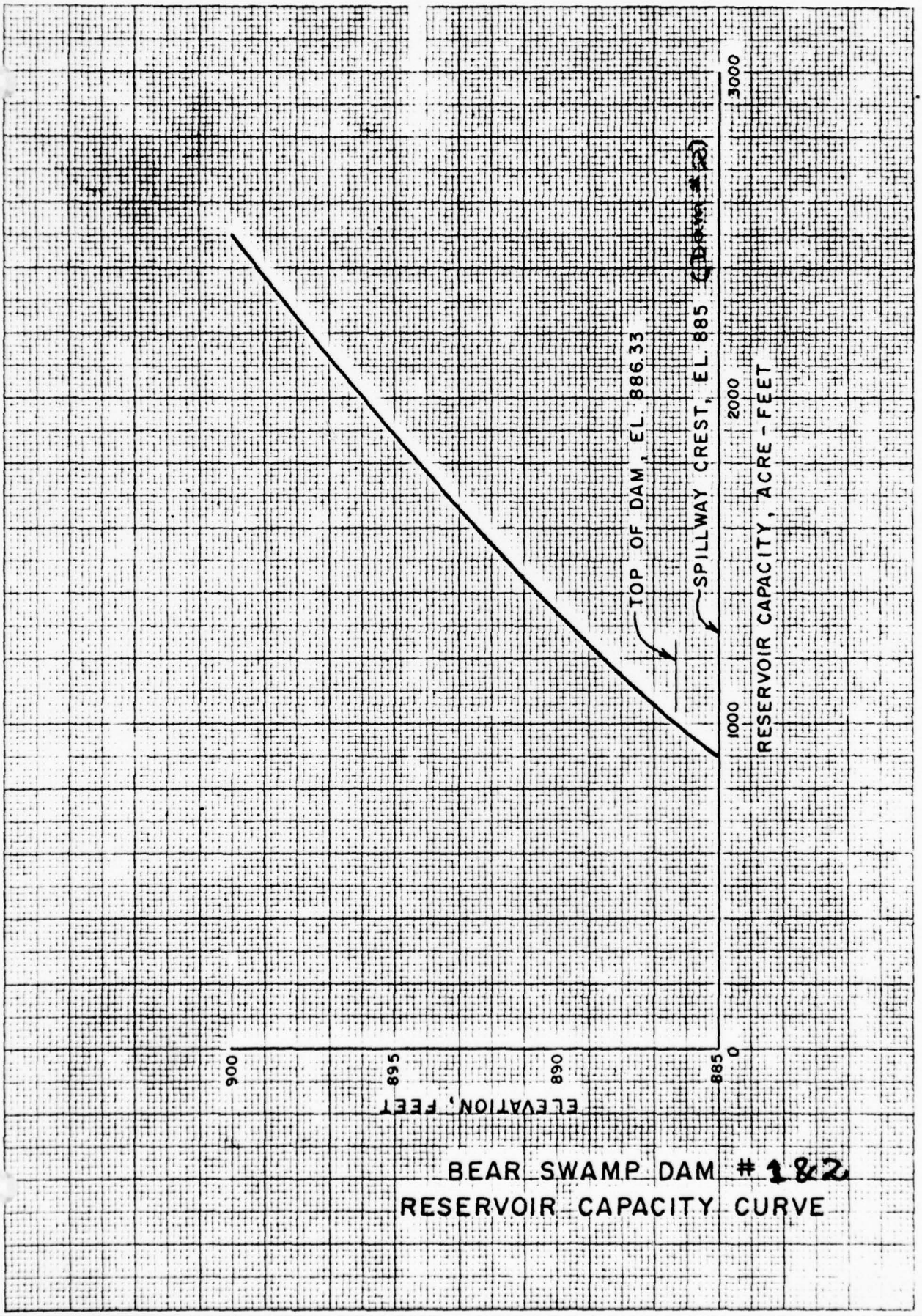
MAX STORAGE = 1000 AC FT
NORMAL STORAGE = 900 AC FT
} From Dam Inventory Table of Bear Swamp Lake Dam 2

RESERVOIR SURFACE AREA = 64 Acres

AT AN ASSUMED ELEVATION OF = 885 FT

ELEVATION (MSL) FT	RESERVOIR AREA ACRES	RESERVOIR VOLUME AC-FT	REMARKS
885	64	900	Normal Vol. of 900 AF is assumed to be at Spillway crest of Bear Swamp Lake Dam #2.
886.33	86.4	1000	Maximum Volume of 1000 AF is assumed to be at top of dams 1 & 2. Worked backward to obtain the area.
892.5	109	1603	
900	128	2492	

PLATE 3, APPENDIX D.



BEAR SWAMP DAM #1&2
RESERVOIR CAPACITY CURVE

ECI-4 ENGINEERING CONSULTANTS, INC.

NEW JERSEY (STATE) DAM SAFETY INSPECTION — SHEET NO. 1 OF
BEAR SWAMP LAKE DAM #1 +2 — JOB NO. 1212-001
UNIT HYDROGRAPH — BY EBJ DATE 7-25-

UNIT HYDROGRAPH - BEAR SWAMP LAKE DAM #1+2

a) DRAINAGE AREA; $A = 0.4$ sq. mi.

b) $L = 0.246$ mi (from gage 2)

c) $T_c = \left(\frac{11.9L^3}{\Delta H}\right)^{0.385} = \left(\frac{11.9 \times 0.246^3}{52}\right)^{.385} = 0.11$ hrs.

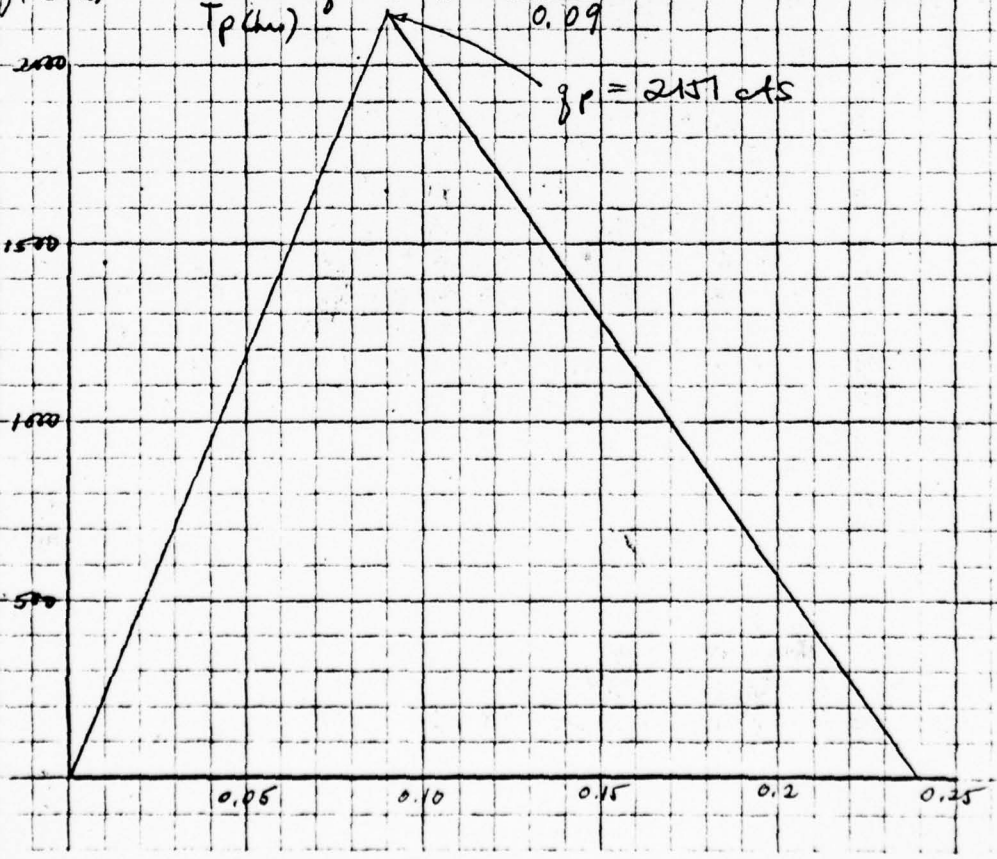
d) Assume $D \simeq \frac{1}{2} T_c = .05$ hrs.

e) $T_p = \frac{D}{2} + 0.6 T_c$

$= \frac{0.05}{2} + 0.6(.11) = 0.09$ hrs.

f) $T_b = 2.67 T_p = 2.67(.09) = .24$ hrs.

g) $q_{p\,(calc)} = \frac{484 A(sq\,mi)}{T_p(hrs)} = \frac{484(0.4)}{0.09} = 2151$ cfs



CI-4 ENGINEERING CONSULTANTS, INC.

NEW JERSEY (STATE) DAM SAFETY INSPECTION — SHEET NO. 2 OF ____
BEAR SWAMP LAKE DAM #1 + 2 — JOB NO. 1212-001
UNIT HYDROGRAPH — BY GBJ DATE 7-25-

$\Delta H_{AB} = 950 - 885 = 65$

$\Delta H_{CD} = 910 - 885 = 25$

$\Delta H_{EF} = 950 - 885 = 65$

$L_{AB} = .67'' \times \frac{24000}{12 \times 5280} = .254$ mi.

$L_{CD} = .60'' \times \frac{24000}{12 \times 5280} = .227$ mi.

$L_{EF} = .68'' \times \frac{24000}{12 \times 5280} = .258$ mi.

$\Delta H_{ave} = \frac{65 + 65 + 25}{3} = 52'$

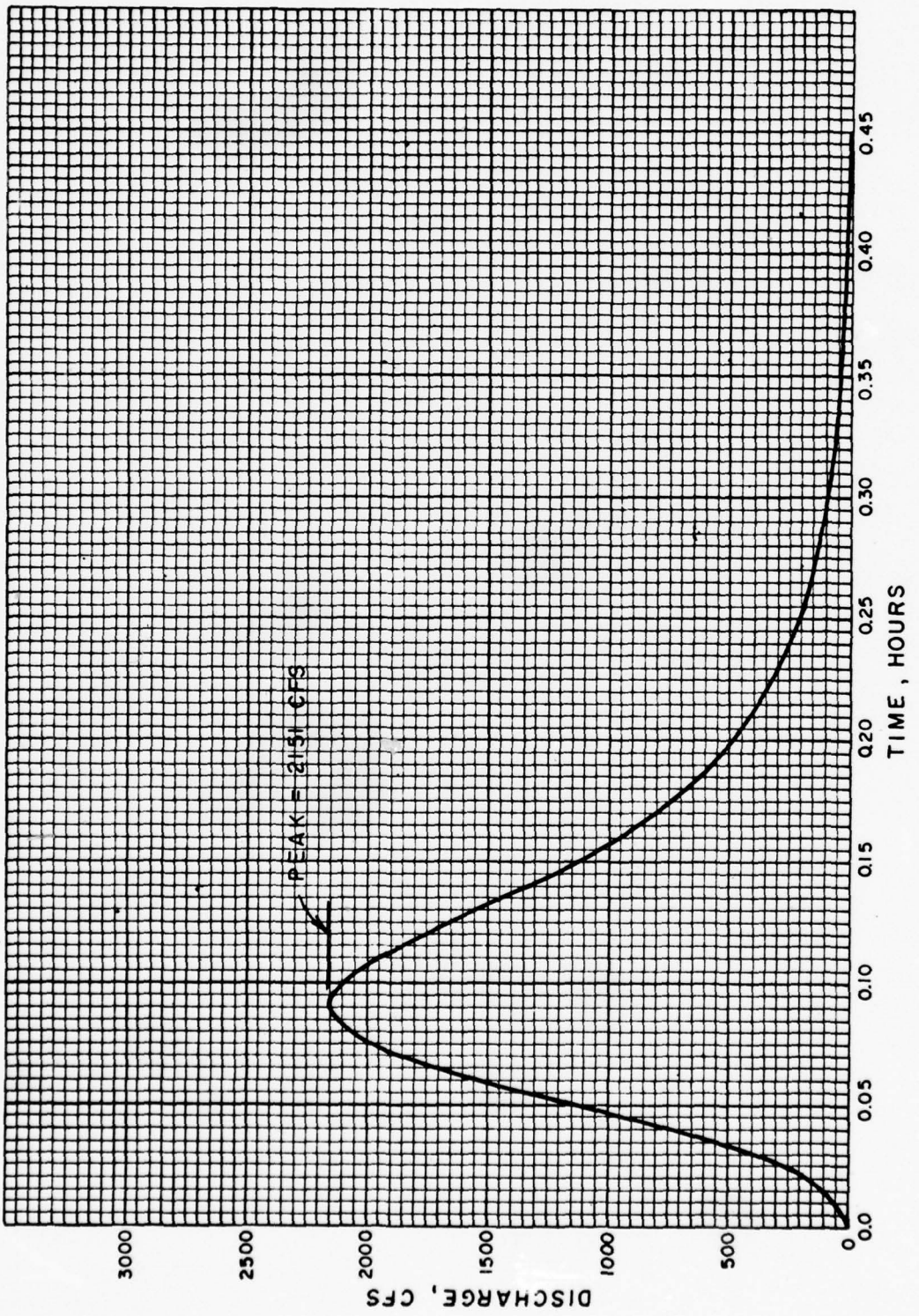
$L_{ave} = \frac{.254 + .227 + .258}{3} = .246$ mi.

ECI-4 **ENGINEERING CONSULTANTS, INC.**

NEW JERSEY (STATE) DAM SAFETY INSPECTION — SHEET NO. 4 OF
BEAR SWAMP LAKE DAM #1 +2 — JOB NO. 1212-001
UNIT HYDROGRAPH — BY EBJ DATE 9-25-

H) DRAW A CURVILINEAR UNIT HYDROGRAPH

TIME RATIO T/Tp	DISCHARGE RATIO q/qp	UNIT GRAPH TIME, T hrs.	UNIT GRAPH DISCHARGE, q cfs
0	0	0	0
0.1	0.015	0.009	32
0.2	0.075	0.018	161
0.3	0.16	0.027	344
0.4	0.28	0.036	602
0.5	0.43	0.045	925
0.6	0.60	0.054	1291
0.7	0.77	0.063	1656
0.8	0.89	0.072	1914
0.9	0.97	0.081	2086
1.0	1.00	0.090	2151
1.1	0.98	0.099	2108
1.2	0.92	0.108	1979
1.3	0.84	0.117	1807
1.4	0.75	0.126	1613
1.5	0.66	0.135	1420
1.6	0.56	0.144	1205
1.8	0.42	0.162	903
2.0	0.32	0.180	688
2.2	0.24	0.198	516
2.4	0.18	0.216	387
2.6	0.13	0.234	280
2.8	0.098	0.252	211
3.0	0.075	0.270	161
3.5	0.036	0.315	77
4.0	0.018	0.360	39
4.5	0.009	0.405	19
5.0	0.004	0.450	9



BEAR SWAMP LAKE DAM NO. 1&2
0.05 HOUR UNIT HYDROGRAPH

SHEET NO. ___ OF ___

PMP Derivation [illegible] JOB NO. [illegible]

Probable Maximum Precipitation BY TJN DATE Feb 1978

PROBABLE MAXIMUM FLOOD CALCULATION (PMF)

DRAINAGE = 0.40 sq. mi.

From Hydrometeorological Report #33 Seasonal Variation of the Probable Maximum Precipitation East of the 105th Meridian for Areas from 10 to 1,000 Square Miles and Duration of 6, 12, 24 and 48 Hours 1956

For D.A. = 10 sq. mi.

6 hour rain fall duration.

PMP = 25.0" for Zone 6 at this Basin.

Since D.A. < 10 sq. mi. No area reduction to be applied

PMP values for varies rain fall duration

Duration	PMP (inch)	
6 Hr.	1 ×	= 25.0"
12 Hr	1.09 ×	27.25
24 Hr	1.17 ×	= 29.25
48 Hr.	1.26 ×	= 31.50

PMP values are reduced by 20% to account for misalignment of Basin and Storm Isohyets.

Duration	PMP	
6 Hr	20	
12 Hr	21.8	
24 Hr	23.4	Convey reduction
48 Hr	25.2	

ECI-4 **ENGINEERING CONSULTANTS, INC.**

NEW JERSEY DAM SAFETY INSPECTION (DEP) SHEET NO. ____ OF ____

PMF DERIVATION – BEAR SWAMP LAKE DAM #182 JOB NO. 1212-001-1

PROBABLE MAXIMUM PRECIPITATION BY KLB DATE 7-27-7[illegible]

PMP - PMF DERIVATION

1) SOIL GROUP "C" & AMC II

2) CN = 85

MIN LOSS RATE FOR ABOVE CONDITION IS 0.12"/HR

OR 0.006"/.05 HR

FOR CN = 85

S = 1.76 IN THE EQ.

$$Q = (P - 0.75)^2 / P + 0.85$$

OR $$Q = (P - 0.352)^2 / (P + 1.408)$$

ECI-4 **ENGINEERING CONSULTANTS, INC.**

NEW JERSEY DAM SAFETY INSPECTION - (DEP) SHEET NO. 1 OF ____

PMF DERIVATION - BEAR SWAMP LAKE DAM #182 JOB NO. 1212-001-1

DIRECT RUNOFF BY KLB DATE 7-27-7

DIRECT RUNOFF FOR COMPUTING PMF.

TIME ENDING (HR)	INCREMENTAL DESIGN RAINFALL (IN)	ACCUMULATIVE DESIGN RAINFALL (IN)	DIRECT RUNOFF ACCUMULATIVE	DIRECT RUNOFF INCREMENTAL	INCREMENTAL LOSS (IN)
0.05	.10	.10	0	0.	0.100
0.10	.10	.20	0	0	0.100
0.15	.10	.30	0	0	0.100
0.20	.10	.40	.001	.001	0.090
0.25	.10	.50	.011	.010	0.090
0.30	.10	.60	.031	.020	0.090
0.35	.10	.70	.057	.026	0.074
0.40	.10	.80	.091	.034	0.066
0.45	.10	.90	.130	.039	0.061
0.50	.10	1.00	.174	.040	0.060
0.55	.10	1.10	.223	.049	0.051
0.60	.10	1.20	.276	.053	0.047
0.65	.10	1.30	.332	.056	0.094
0.70	.10	1.40	.391	.059	0.041
0.75	.10	1.50	.453	.062	0.038
0.80	.10	1.60	.518	.065	0.035
0.85	.10	1.70	.585	.067	0.033
0.90	.10	1.80	.654	.069	0.031
0.95	.10	1.90	.724	.070	0.030
2.0 1.00	.10	2.00	.797	.073	0.027
1.05	.12	2.12	.886	.089	0.031
1.10	.12	2.24	.977	.091	0.029
1.15	.12	2.36	1.070	.093	0.027
1.20	.12	2.48	1.165	.095	0.025
1.25	.12	2.60	1.261	.096	0.024
1.30	.12	2.72	1.358	.097	0.023
1.35	.12	2.84	1.457	.099	0.021
1.40	.12	2.96	1.557	.100	0.020
1.45	.12	3.08	1.658	.101	0.019
1.50	.12	3.20	1.760	.102	0.018

ECI-4 **ENGINEERING CONSULTANTS, INC.**

NEW JERSEY DAM SAFETY INSPECTION (DEP) SHEET NO. 2 OF ____
PMF DERIVATION - BEAR SWAMP LAKE DAM #122 JOB NO. 1212-001-1.
DIRECT RUNOFF BY KLB DATE 7-22-2

DIRECT RUNOFF FOR COMPUTING PMF

	TIME ENDING (HR)	INCREMENTAL DESIGN RAINFALL (IN)	ACCUMULATIVE DESIGN RAINFALL (IN)	DIRECT RUNOFF ACCUMULATIVE	DIRECT RUNOFF INCREMENTAL	INCREMENTAL LOSS (IN)
	1.55	.12	3.32	1.863	.103	0.017
	1.60	.12	3.44	1.967	.104	0.016
	1.65	.12	3.56	2.072	.105	0.015
	1.70	.12	3.68	2.177	.105	0.015
	1.75	.12	3.80	2.283	.106	0.014
	1.80	.12	3.92	2.389	.106	0.014
	1.85	.12	4.04	2.497	.107	0.013
	1.90	.12	4.16	2.604	.107	0.013
	1.95	.12	4.28	2.713	.109	0.011
2.4	2.00	.12	4.40	2.821	.108	0.012
	2.05	.15	4.55	2.958	.137	0.013
	2.10	.15	4.70	3.095	.137	0.013
	2.15	.15	4.85	3.233	.138	0.012
	2.20	.15	5.00	3.371	.138	0.012
	2.25	.15	5.15	3.510	.139	0.011
	2.30	.15	5.30	3.650	.140	0.010
	2.35	.15	5.45	3.790	.140	0.010
	2.40	.15	5.60	3.930	.140	0.010
	2.45	.15	5.75	4.071	.141	0.009
	2.50	.15	5.90	4.212	.141	0.009
	2.55	.15	6.05	4.353	.141	0.009
	2.60	.15	6.20	4.495	.142	0.008
	2.65	.15	6.35	4.637	.142	0.008
	2.70	.15	6.50	4.780	.143	0.007
	2.75	.15	6.65	4.922	.142	0.008
	2.80	.15	6.80	5.065	.143	0.007
	2.85	.15	6.95	5.209	.144	0.006
	2.90	.15	7.10	5.352	.144	0.006
	2.95	.15	7.25	5.496	.144	0.006
3.0	3.00	.15	7.40	5.640	.144	0.006

ECI-4 ENGINEERING CONSULTANTS, INC.

NEW JERSEY DAM SAFETY INSPECTION - (DIF) SHEET NO. 3 OF ____

PMF DERIVATION - BEAR SWAMP LAKE DAM # 122 JOB NO. 1212-001-1

DIRECT RUNOFF BY KIB DATE 7-27-81

DIRECT RUNOFF FOR COMPUTING PMF.

	TIME ENDING (HR)	INCREMENTAL DESIGN RAINFALL (IN)	ACCUMULATIVE DESIGN RAINFALL (IN)	DIRECT RUNOFF ACCUMULATIVE	DIRECT RUNOFF INCREMENTAL	INCREMENTAL LOSS (IN)
	3.05	0.37	7.77	5.996	0.364	0.006
	3.10	0.37	8.14	6.352	0.364	0.006
	3.15	0.37	8.51	6.710	0.364	0.006
	3.20	0.37	8.88	7.069	0.364	0.006
	3.25	0.37	9.25	7.429	0.364	0.006
	3.30	0.37	9.62	7.789	0.364	0.006
	3.35	0.37	9.99	8.150	0.364	0.006
	3.40	0.37	10.36	8.511	0.364	0.006
	3.45	0.37	10.73	8.873	0.364	0.006
	3.50	0.37	11.10	9.236	0.364	0.006
(7.59%)	3.55	0.57	11.67	9.795	0.564	0.006
	3.60	0.37	12.04	10.158	0.364	0.006
	3.65	0.37	12.41	10.522	0.364	0.006
	3.70	0.37	12.78	10.886	0.364	0.006
	3.75	0.37	13.15	11.251	0.364	0.006
	3.80	0.37	13.52	11.616	0.364	0.006
	3.85	0.37	13.89	11.980	0.364	0.006
	3.90	0.37	14.26	12.346	0.364	0.006
	3.95	0.37	14.63	12.711	0.364	0.006
7.6	4.00	0.37	15.00	13.077	0.369	0.006
	4.05	0.14	15.14	13.215	0.134	0.006
	4.10	0.14	15.28	13.354	0.134	0.006
	4.15	0.14	15.42	13.492	0.134	0.006
	4.20	0.14	15.56	13.631	0.134	0.006
	4.25	0.14	15.70	13.769	0.134	0.006
	4.30	0.14	15.84	13.908	0.134	0.006
	4.35	0.14	15.98	14.046	0.134	0.006
	4.40	0.14	16.12	14.185	0.134	0.006
	4.45	0.14	16.26	14.323	0.134	0.006
	4.50	0.14	16.40	14.462	0.134	0.006

ECI-4 **ENGINEERING CONSULTANTS, INC.**

NEW JERSEY DAM SAFETY INSPECTION — SHEET NO. 4 OF ____

PMF DERIVATION-BEAR SWAMP LAKE DAM #1&2 — JOB NO. 1212-001-1

DIRECT RUNOFF — BY K/B — DATE 7-27-

DIRECT RUNOFF FOR COMPUTING PMF

	TIME ENDING (HR)	INCREMENTAL DESIGN RAINFALL (IN)	ACCUMULATIVE DESIGN RAINFALL (IN)	DIRECT RUNOFF ACCUMULATIVE	DIRECT RUNOFF INCREMENTAL	INCREMENTAL LOSS (IN)
	4.55	.14	16.54	14.601	0.134	0.006
	4.60	.14	16.68	14.739	0.134	0.006
	4.65	.14	16.82	14.878	0.134	0.006
	4.70	.14	16.96	15.017	0.134	0.006
	4.75	.14	17.10	15.155	0.134	0.006
	4.80	.14	17.24	15.294	0.134	0.006
	4.85	.14	17.38	15.433	0.134	0.006
	4.90	.14	17.52	15.572	0.134	0.006
	4.95	.14	17.66	15.710	0.134	0.006
2.8	5.00	.14	17.80	15.849	0.134	0.006
	5.05	.11	17.91	15.958	0.104	0.006
	5.10	.11	18.02	16.067	0.104	0.006
	5.15	.11	18.13	16.177	0.104	0.006
	5.20	.11	18.24	16.286	0.104	0.006
	5.25	.11	18.35	16.395	0.104	0.006
	5.30	.11	18.46	16.504	0.104	0.006
	5.35	.11	18.57	16.613	0.104	0.006
	5.40	.11	18.68	16.722	0.104	0.006
	5.45	.11	18.79	16.831	0.104	0.006
	5.50	.11	18.90	16.941	0.104	0.006
	5.55	.11	19.01	17.050	0.104	0.006
	5.60	.11	19.12	17.159	0.104	0.006
	5.65	.11	19.23	17.268	0.104	0.006
	5.70	.11	19.34	17.377	0.104	0.006
	5.75	.11	19.45	17.487	0.104	0.006
	5.80	.11	19.56	17.596	0.104	0.006
	5.85	.11	19.67	17.705	0.104	0.006
	5.90	.11	19.78	17.814	0.104	0.006
	5.95	.11	19.89	17.923	0.104	0.006
2.2	6.00	.11	20.00	18.033	0.104	0.006

* MINIMUM LOSS RATE = .12" /HR = .006"/.05 HR
(AFTER THIS RATE IS REACHED

1-4 ENGINEERING CONSULTANTS, INC.

NEW JERSEY (STATE) DAM SAFETY INSPECTION — SHEET NO. 1 OF
BEAR SWAMP LAKE DAMS #1, #2 — JOB NO. 1212-001-1
INPUT TO HEC-1 (REVISED) — BY KLB DATE 8-8-

INPUT TO HEC-1

#	ELEV (FT)	HEAD ABOVE SPILLWAY (FT)	Y2 STORAGE (AC-FT)	DAM #1 DISCHARGE (CFS)	DAM #2 DISCHARGE (CFS)	Y3 TOTAL DISCHARGE (CFS)
1	885.00 (SPILLWAY CREST)	0.0	900	0.0	0.0	0.0
2	885.50	0.5	940	0.00	40.0	40.0
3	886.00	1.0	980	0.00	90.0	90.0
4	886.25	1.25	998	0.00	135.0	135.0
5	886.33 (TOP OF DAM)	1.33	1000	0.00	150.0	150.0
6	886.50	1.50	1018	2000	190.0	210.0
7	887.00	2.00	1060	560.0	350.0	910.0
8	888.00	3.00	1150	2075.0	800.0	2875.0
9	889.00	4.00	1245	4150.0	1400.0	5550
10	890.00	5.00	1350	6720	2080.0	8800.

****
HEC-1 VERSION DATED JAN 1973

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DAM SAFETY INSPECTION - NEW JERSEY STATE
BEAR SWAMP LAKE DAMS 1 AND 2
PMF FLOOD ROUTING

JOB SPECIFICATION

NQ	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
150	0	3	0	0	0	0	0	0	0

JOPER	NWT
3	0

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SUB-AREA RUNOFF COMPUTATION

INPUT UNIT HYDROGRAPH DERIVED FROM SCS METHOD

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME
1	0	0	0	0	0	1

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
0	-1	0.40	0.00	0.40	0.00	0.000	0	0	0

PRECIP DATA

NP	STORM	DAJ	DAK
120	0.00	0.00	0.00

PRECIP PATTERN

0.00	0.00	0.00	0.00	0.01	0.02	0.02	0.03	0.03	0.04
0.04	0.05	0.05	0.05	0.06	0.06	0.06	0.06	0.07	0.07
0.08	0.09	0.09	0.09	0.09	0.09	0.09	0.10	0.10	0.10
0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
0.13	0.13	0.13	0.13	0.13	0.14	0.14	0.14	0.14	0.14
0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14
0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36
0.56	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36
0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13
0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13
0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10

LOSS DATA

STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

GIVEN UNIT GRAPH, NUMGG= 10

0.	1290.	2151.	1060.	475.	220.	105.	45.	25.	9.

UNIT GRAPH TOTALS 5356. CFS OR 1.03 INCHES OVER THE AREA

RECESSION DATA

STRTQ= 0.00 QRCSN= 0.00 RTIOR= 1.00

TIME	END-OF-PERIOD FLOW RAIN	EXCS	COMP Q
1	0.00	0.00	0.
2	0.00	0.00	0.
3	0.00	0.00	0.
4	0.00	0.00	0.
5	0.01	0.01	1.
6	0.02	0.02	14.
7	0.02	0.02	47.
8	0.03	0.03	86.
9	0.03	0.03	124.
10	0.04	0.04	161.
11	0.04	0.04	188.
12	0.05	0.05	213.
13	0.05	0.05	244.
14	0.05	0.05	269.
15	0.06	0.06	289.
16	0.06	0.06	307.
17	0.06	0.06	324.
18	0.06	0.06	339.
19	0.07	0.07	352.
20	0.07	0.07	363.
21	0.08	0.08	373.
22	0.09	0.09	402.
23	0.09	0.09	444.
24	0.09	0.09	470.
25	0.09	0.09	487.
26	0.09	0.09	500.
27	0.09	0.09	509.
28	0.10	0.10	517.
29	0.10	0.10	525.
30	0.10	0.10	532.
31	0.10	0.10	538.
32	0.10	0.10	543.
33	0.10	0.10	549.
34	0.10	0.10	554.
35	0.10	0.10	558.
36	0.10	0.10	562.
37	0.10	0.10	565.
38	0.10	0.10	567.
39	0.10	0.10	570.
40	0.10	0.10	574.
41	0.13	0.13	578.
42	0.13	0.13	614.
43	0.13	0.13	677.
44	0.13	0.13	709.
45	0.13	0.13	725.
46	0.14	0.14	734.
47	0.14	0.14	741.
48	0.14	0.14	745.
49	0.14	0.14	748.
50	0.14	0.14	750.

51	0.14	0.14	752.
52	0.14	0.14	754.
53	0.14	0.14	756.
54	0.14	0.14	758.
55	0.14	0.14	760.
56	0.14	0.14	762.
57	0.14	0.14	762.
58	0.14	0.14	765.
59	0.14	0.14	768.
60	0.14	0.14	770.
61	0.36	0.36	770.
62	0.36	0.36	1046.
63	0.36	0.36	1519.
64	0.36	0.36	1757.
65	0.36	0.36	1861.
66	0.36	0.36	1909.
67	0.36	0.36	1933.
68	0.36	0.36	1942.
69	0.36	0.36	1948.
70	0.36	0.36	1949.
71	0.36	0.36	1949.
72	0.36	0.36	2199.
73	0.36	0.36	2379.
74	0.36	0.36	2165.
75	0.36	0.36	2044.
76	0.36	0.36	1993.
77	0.36	0.36	1970.
78	0.36	0.36	1958.
79	0.36	0.36	1954.
80	0.36	0.36	1950.
81	0.13	0.13	1949.
82	0.13	0.13	1662.
83	0.13	0.13	1167.
84	0.13	0.13	918.
85	0.13	0.13	809.
86	0.13	0.13	759.
87	0.13	0.13	734.
88	0.13	0.13	724.
89	0.13	0.13	718.
90	0.13	0.13	717.
91	0.13	0.13	717.
92	0.13	0.13	717.
93	0.13	0.13	717.
94	0.13	0.13	717.
95	0.13	0.13	717.
96	0.13	0.13	717.
97	0.13	0.13	717.
98	0.13	0.13	717.
99	0.13	0.13	717.
100	0.13	0.13	717.
101	0.10	0.10	717.
102	0.10	0.10	680.
103	0.10	0.10	615.
104	0.10	0.10	583.
105	0.10	0.10	569.
106	0.10	0.10	562.

107	0.10	0.10	559.
108	0.10	0.10	557.
109	0.10	0.10	557.
110	0.10	0.10	557.
111	0.10	0.10	557.
112	0.10	0.10	557.
113	0.10	0.10	557.
114	0.10	0.10	557.
115	0.10	0.10	557.
116	0.10	0.10	557.
117	0.10	0.10	557.
118	0.10	0.10	557.
119	0.10	0.10	557.
120	0.10	0.10	557.
121	0.00	0.00	557.
122	0.00	0.00	427.
123	0.00	0.00	203.
124	0.00	0.00	90.
125	0.00	0.00	41.
126	0.00	0.00	18.
127	0.00	0.00	7.
128	0.00	0.00	3.
129	0.00	0.00	0.
130	0.00	0.00	0.
131	0.00	0.00	0.
132	0.00	0.00	0.
133	0.00	0.00	0.
134	0.00	0.00	0.
135	0.00	0.00	0.
136	0.00	0.00	0.
137	0.00	0.00	0.
138	0.00	0.00	0.
139	0.00	0.00	0.
140	0.00	0.00	0.
141	0.00	0.00	0.
142	0.00	0.00	0.
143	0.00	0.00	0.
144	0.00	0.00	0.
145	0.00	0.00	0.
146	0.00	0.00	0.
147	0.00	0.00	0.
148	0.00	0.00	0.
149	0.00	0.00	0.
150	0.00	0.00	0.
SUM	17.61	17.61	95755.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	2379.	797.	638.	638.	95745.
INCHES		10.55	10.55	10.55	10.55
AC-FT		395.	395.	395.	395.

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HYDROGRAPH ROUTING

ROUTE HYDROGRAPH THRU BEAR SWAMP DAMS 1 AND 2

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME
1	1	0	0	20	0	1

ROUTING DATA

GLOSS	CLOSS	AVG	IRES	ISAME
0.0	0.000	0.00	1	0

NSTPS	NSTOL	LAG	AMSKK	X	TSK	STORA
0	0	0	0.000	0.000	0.000	-1.

STORAGE=	900.	940.	980.	998.	1000.	1018.	1060.	1150.	1245.	1350.
OUTFLOW=	0.	40.	90.	135.	150.	210.	910.	2875.	5550.	8800.

TIME	EOP STOR	AVG IN	EOP OUT
1	900.	0.	0.
2	900.	0.	0.
3	900.	0.	0.
4	900.	0.	0.
5	900.	0.	0.
6	900.	7.	0.
7	900.	31.	0.
8	900.	67.	0.
9	900.	105.	0.
10	901.	143.	1.
11	902.	175.	2.
12	902.	201.	2.
13	903.	229.	3.
14	904.	257.	4.
15	906.	279.	6.
16	907.	298.	7.
17	908.	316.	8.
18	909.	332.	9.
19	911.	346.	11.
20	912.	357.	12.
21	914.	368.	14.
22	915.	388.	15.
23	917.	423.	17.
24	919.	457.	19.
25	921.	479.	21.
26	923.	494.	23.
27	925.	504.	25.
28	927.	513.	27.
29	929.	521.	29.
30	931.	529.	31.
31	933.	535.	33.
32	935.	541.	35.
33	937.	546.	37.
34	939.	552.	39.
35	941.	556.	42.
36	943.	560.	44.
37	945.	563.	47.
38	948.	566.	50.

39	950.	569.	52.
40	952.	572.	55.
41	954.	576.	58.
42	956.	596.	60.
43	959.	645.	63.
44	961.	693.	67.
45	964.	717.	70.
46	967.	729.	73.
47	969.	737.	77.
48	972.	743.	80.
49	975.	747.	84.
50	978.	749.	87.
51	980.	751.	92.
52	983.	753.	95.
53	986.	755.	105.
54	988.	757.	112.
55	991.	759.	119.
56	994.	761.	125.
57	996.	762.	132.
58	999.	764.	146.
59	1002.	767.	156.
60	1004.	769.	165.
61	1007.	770.	173.
62	1010.	908.	183.
63	1014.	1282.	198.
64	1020.	1638.	249.
65	1026.	1809.	353.
66	1032.	1885.	455.
67	1036.	1921.	553.
68	1044.	1938.	645.
69	1049.	1945.	732.
70	1054.	1949.	813.
71	1058.	1949.	888.
72	1063.	2074.	984.
73	1066.	2289.	1097.
74	1073.	2272.	1198.
75	1076.	2105.	1277.
76	1079.	2019.	1341.
77	1082.	1982.	1396.
78	1084.	1964.	1445.
79	1086.	1956.	1489.
80	1088.	1952.	1529.
81	1090.	1950.	1565.
82	1090.	1805.	1586.
83	1090.	1414.	1571.
84	1088.	1043.	1526.
85	1085.	864.	1469.
86	1082.	784.	1409.
87	1080.	747.	1352.
88	1077.	729.	1298.
89	1075.	721.	1249.
90	1073.	718.	1203.
91	1071.	717.	1161.
92	1069.	717.	1123.
93	1068.	717.	1088.
94	1066.	717.	1056.

95	1065.	717.	1026.
96	1064.	717.	1000.
97	1063.	717.	975.
98	1061.	717.	953.
99	1061.	717.	933.
100	1060.	717.	914.
101	1059.	717.	900.
102	1058.	698.	886.
103	1057.	647.	871.
104	1056.	599.	852.
105	1055.	576.	834.
106	1054.	565.	816.
107	1053.	560.	799.
108	1052.	558.	783.
109	1051.	557.	768.
110	1050.	557.	754.
111	1049.	557.	741.
112	1049.	557.	729.
113	1048.	557.	717.
114	1047.	557.	706.
115	1047.	557.	696.
116	1046.	557.	687.
117	1046.	557.	679.
118	1045.	557.	670.
119	1045.	557.	663.
120	1044.	557.	656.
121	1044.	557.	649.
122	1043.	492.	639.
123	1042.	315.	617.
124	1040.	147.	586.
125	1038.	66.	551.
126	1036.	30.	516.
127	1034.	13.	483.
128	1032.	5.	451.
129	1030.	1.	421.
130	1029.	0.	393.
131	1027.	0.	367.
132	1025.	0.	342.
133	1024.	0.	320.
134	1023.	0.	298.
135	1022.	0.	278.
136	1021.	0.	260.
137	1019.	0.	242.
138	1019.	0.	226.
139	1018.	0.	211.
140	1017.	0.	207.
141	1016.	0.	204.
142	1015.	0.	201.
143	1014.	0.	199.
144	1013.	0.	196.
145	1013.	0.	193.
146	1012.	0.	190.
147	1011.	0.	188.
148	1010.	0.	185.
149	1009.	0.	183.
150	1009.	0.	180.

SUM 69400.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1586.	575.	462.	462.	69400.
INCHES		13.39	10.44	10.44	10.44
AC-FT		285.	286.	286.	286.

RUNOFF SUMMARY, AVERAGE FLOW

		PEAK	6-HOUR	24-HOUR	72-HOUR	AREA
HYDROGRAPH AT	1	2379.	797.	638.	638.	0.40
ROUTED TO	1	1586.	575.	462.	462.	0.40

****
HEC-1 VERSION DATED JAN 1973

****

DAM SAFETY INSPECTION - NEW JERSEY STATE
BEAR SWAMP LAKE DAMS 1 AND 2
ONE HALF OF PMF FLOOD ROUTING

JOB SPECIFICATION

NQ	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
150	0	3	0	0	0	0	0	0	0

JOPER	NWT
3	0

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SUB-AREA RUNOFF COMPUTATION

INPUT UNIT HYDROGRAPH DERIVED FROM SCS METHOD

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME
1	0	0	0	0	0	1

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
0	-1	0.40	0.00	0.40	0.00	0.500	0	0	0

PRECIP DATA

NP	STORM	DAJ	DAK
120	0.00	0.00	0.00

PRECIP PATTERN

0.00	0.00	0.00	0.00	0.01	0.02	0.02	0.03	0.03	0.04
0.04	0.05	0.05	0.05	0.06	0.06	0.06	0.06	0.07	0.07
0.08	0.09	0.09	0.09	0.09	0.09	0.09	0.10	0.10	0.10
0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
0.13	0.13	0.13	0.13	0.13	0.14	0.14	0.14	0.14	0.14
0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14
0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36
0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36
0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13
0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13
0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10

LOSS DATA

STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

GIVEN UNIT GRAPH, NUMGQ= 10

0.	1230.	2151.	1080.	475.	220.	105.	45.	25.	5.

UNIT GRAPH TOTALS 5356. CFS OR 1.03 INCHES OVER THE AREA

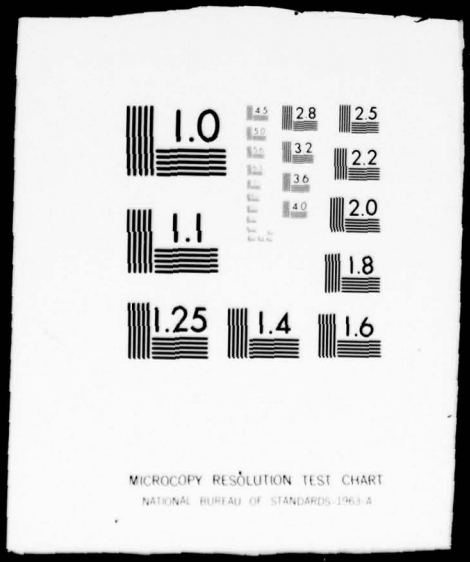
AD-A060 146 NEW JERSEY STATE DEPT OF ENVIRONMENTAL PROTECTION TRENTON F/G 13/2
NATIONAL DAM SAFETY PROGRAM. BEAR SWAMP LAKE DAM NUMBER 2 (NJ00--ETC(U)
AUG 78 R GERSHOWITZ DACW61-78-C-0124
UNCLASSIFIED NL

2 OF 2
AD
A060146

END
DATE
FILMED
12 78
DDC

2 OF 2

AD
A060146



RECESSION DATA

STRTQ= 0.00 QRCSN= 0.00 RTIOR= 1.00

TIME	END-OF-PERIOD FLOW RAIN	EXCS	COMP Q
1	0.00	0.00	0.
2	0.00	0.00	0.
3	0.00	0.00	0.
4	0.00	0.00	0.
5	0.01	0.01	1.
6	0.02	0.02	14.
7	0.02	0.02	47.
8	0.03	0.03	86.
9	0.03	0.03	124.
10	0.04	0.04	161.
11	0.04	0.04	188.
12	0.05	0.05	213.
13	0.05	0.05	244.
14	0.05	0.05	269.
15	0.06	0.06	289.
16	0.06	0.06	307.
17	0.06	0.06	324.
18	0.06	0.06	339.
19	0.07	0.07	352.
20	0.07	0.07	363.
21	0.08	0.08	373.
22	0.09	0.09	402.
23	0.09	0.09	444.
24	0.09	0.09	470.
25	0.09	0.09	487.
26	0.09	0.09	500.
27	0.09	0.09	509.
28	0.10	0.10	517.
29	0.10	0.10	525.
30	0.10	0.10	532.
31	0.10	0.10	538.
32	0.10	0.10	543.
33	0.10	0.10	549.
34	0.10	0.10	554.
35	0.10	0.10	558.
36	0.10	0.10	562.
37	0.10	0.10	565.
38	0.10	0.10	567.
39	0.10	0.10	570.
40	0.10	0.10	574.
41	0.13	0.13	578.
42	0.13	0.13	614.
43	0.13	0.13	677.
44	0.13	0.13	709.
45	0.13	0.13	725.
46	0.14	0.14	734.
47	0.14	0.14	741.
48	0.14	0.14	745.
49	0.14	0.14	748.
50	0.14	0.14	750.

51	0.14	0.14	752.
52	0.14	0.14	754.
53	0.14	0.14	756.
54	0.14	0.14	758.
55	0.14	0.14	760.
56	0.14	0.14	762.
57	0.14	0.14	762.
58	0.14	0.14	765.
59	0.14	0.14	768.
60	0.14	0.14	770.
61	0.36	0.36	770.
62	0.36	0.36	1046.
63	0.36	0.36	1519.
64	0.36	0.36	1757.
65	0.36	0.36	1861.
66	0.36	0.36	1909.
67	0.36	0.36	1933.
68	0.36	0.36	1942.
69	0.36	0.36	1948.
70	0.36	0.36	1949.
71	0.56	0.56	1949.
72	0.36	0.36	2199.
73	0.36	0.86	2379.
74	0.36	0.36	2165.
75	0.36	0.36	2044.
76	0.36	0.36	1993.
77	0.36	0.36	1970.
78	0.36	0.36	1958.
79	0.36	0.36	1954.
80	0.36	0.36	1950.
81	0.13	0.13	1949.
82	0.13	0.13	1662.
83	0.13	0.13	1167.
84	0.13	0.13	918.
85	0.13	0.13	809.
86	0.13	0.13	759.
87	0.13	0.13	734.
88	0.13	0.13	724.
89	0.13	0.13	718.
90	0.13	0.13	717.
91	0.13	0.13	717.
92	0.13	0.13	717.
93	0.13	0.13	717.
94	0.13	0.13	717.
95	0.13	0.13	717.
96	0.13	0.13	717.
97	0.13	0.13	717.
98	0.13	0.13	717.
99	0.13	0.13	717.
100	0.13	0.13	717.
101	0.10	0.10	717.
102	0.10	0.10	680.
103	0.10	0.10	615.
104	0.10	0.10	583.
105	0.10	0.10	569.
106	0.10	0.10	562.

107	0.10	0.10	559.
108	0.10	0.10	557.
109	0.10	0.10	557.
110	0.10	0.10	557.
111	0.10	0.10	557.
112	0.10	0.10	557.
113	0.10	0.10	557.
114	0.10	0.10	557.
115	0.10	0.10	557.
116	0.10	0.10	557.
117	0.10	0.10	557.
118	0.10	0.10	557.
119	0.10	0.10	557.
120	0.10	0.10	557.
121	0.00	0.00	557.
122	0.00	0.00	427.
123	0.00	0.00	203.
124	0.00	0.00	90.
125	0.00	0.00	41.
126	0.00	0.00	18.
127	0.00	0.00	7.
128	0.00	0.00	3.
129	0.00	0.00	0.
130	0.00	0.00	0.
131	0.00	0.00	0.
132	0.00	0.00	0.
133	0.00	0.00	0.
134	0.00	0.00	0.
135	0.00	0.00	0.
136	0.00	0.00	0.
137	0.00	0.00	0.
138	0.00	0.00	0.
139	0.00	0.00	0.
140	0.00	0.00	0.
141	0.00	0.00	0.
142	0.00	0.00	0.
143	0.00	0.00	0.
144	0.00	0.00	0.
145	0.00	0.00	0.
146	0.00	0.00	0.
147	0.00	0.00	0.
148	0.00	0.00	0.
149	0.00	0.00	0.
150	0.00	0.00	0.
SUM	17.61	17.61	95755.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	2379.	797.	638.	638.	95745.
INCHES		18.55	18.55	18.55	18.55
AC-FT		395.	395.	395.	395.

RUNOFF MULTIPLIED BY 0.50

0.	0.	0.	0.	0.	7.	23.	43.	62.	80.
94.	106.	122.	134.	144.	153.	162.	169.	176.	181.
186.	201.	222.	235.	243.	250.	254.	258.	262.	266.

269.	271.	274.	277.	279.	281.	282.	283.	285.	287.	
289.	307.	338.	354.	362.	367.	370.	372.	374.	375.	
376.	377.	378.	379.	380.	381.	381.	382.	384.	385.	
385.	523.	759.	878.	930.	954.	966.	971.	974.	974.	
974.	1099.	1189.	1082.	1022.	996.	985.	979.	977.	975.	
974.	831.	583.	459.	404.	379.	367.	362.	359.	358.	
358.	358.	358.	358.	358.	358.	358.	358.	358.	358.	
358.	340.	307.	291.	284.	281.	279.	278.	278.	278.	
278.	278.	278.	278.	278.	278.	278.	278.	278.	278.	
278.	213.	101.	45.	20.	9.	3.	1.	0.	0.	
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1189.	398.	319.	319.	47872.
INCHES		9.27	9.27	9.27	9.27
AC-FT		197.	197.	197.	197.

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HYDROGRAPH ROUTING

ROUTE HYDROGRAPH THRU BEAR SWAMP DAMS 1 AND 2

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME
1	1	0	0	20	0	1

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME
0.0	0.000	0.00	1	0

NSTPS	NSTOL	LAG	AMSKK	X	TSK	STORA
0	0	0	0.000	0.000	0.000	-1.

STORAGE=	900.	940.	980.	998.	1000.	1018.	1060.	1150.	1245.	1350.
OUTFLOW=	0.	40.	90.	135.	150.	210.	910.	2875.	5550.	8800.

TIME	EOP STOR	AVG IN	EOP OUT
1	900.	0.	0.
2	900.	0.	0.
3	900.	0.	0.
4	900.	0.	0.
5	900.	0.	0.
6	900.	3.	0.
7	900.	15.	0.
8	900.	33.	0.
9	900.	52.	0.
10	900.	71.	0.
11	901.	87.	1.
12	901.	100.	1.
13	901.	114.	1.
14	902.	128.	2.
15	903.	139.	3.
16	903.	149.	3.

17	904.	158.	9.
18	904.	166.	4.
19	905.	173.	5.
20	906.	178.	6.
21	907.	184.	7.
22	907.	194.	7.
23	908.	211.	8.
24	909.	228.	9.
25	910.	239.	10.
26	911.	247.	11.
27	912.	252.	12.
28	913.	256.	13.
29	914.	260.	14.
30	915.	264.	15.
31	916.	267.	16.
32	917.	270.	17.
33	918.	273.	18.
34	919.	276.	19.
35	920.	278.	20.
36	921.	280.	21.
37	923.	281.	23.
38	924.	283.	24.
39	925.	284.	25.
40	926.	286.	26.
41	927.	288.	27.
42	928.	298.	28.
43	929.	322.	29.
44	930.	346.	30.
45	932.	358.	32.
46	933.	364.	33.
47	935.	368.	35.
48	936.	371.	36.
49	937.	373.	37.
50	939.	374.	39.
51	940.	375.	40.
52	941.	376.	42.
53	943.	377.	44.
54	944.	378.	45.
55	946.	379.	47.
56	947.	380.	49.
57	948.	381.	51.
58	950.	382.	52.
59	951.	383.	54.
60	952.	384.	56.
61	954.	385.	57.
62	955.	454.	59.
63	958.	641.	62.
64	961.	819.	66.
65	964.	904.	71.
66	968.	942.	75.
67	972.	960.	80.
68	975.	969.	84.
69	979.	972.	89.
70	983.	974.	97.
71	986.	974.	106.
72	990.	1037.	116.

73	994.	1144.	126.
74	998.	1136.	141.
75	1002.	1052.	158.
76	1006.	1009.	170.
77	1009.	991.	181.
78	1012.	982.	192.
79	1016.	978.	205.
80	1019.	976.	229.
81	1022.	975.	278.
82	1024.	902.	320.
83	1026.	707.	346.
84	1026.	521.	357.
85	1027.	432.	362.
86	1027.	392.	364.
87	1027.	373.	365.
88	1027.	364.	365.
89	1027.	360.	365.
90	1027.	359.	364.
91	1027.	358.	364.
92	1027.	358.	363.
93	1027.	358.	363.
94	1027.	358.	363.
95	1027.	358.	362.
96	1027.	358.	362.
97	1027.	358.	362.
98	1027.	358.	362.
99	1027.	358.	361.
100	1027.	358.	361.
101	1027.	358.	361.
102	1027.	349.	360.
103	1026.	323.	358.
104	1026.	299.	354.
105	1026.	288.	349.
106	1026.	282.	345.
107	1025.	280.	341.
108	1025.	279.	337.
109	1025.	278.	333.
110	1025.	278.	329.
111	1024.	278.	326.
112	1024.	278.	322.
113	1024.	278.	320.
114	1024.	278.	317.
115	1024.	278.	314.
116	1024.	278.	312.
117	1024.	278.	310.
118	1023.	278.	307.
119	1023.	278.	306.
120	1023.	278.	304.
121	1023.	278.	302.
122	1023.	246.	298.
123	1022.	197.	289.
124	1021.	73.	274.
125	1020.	33.	258.
126	1019.	15.	242.
127	1019.	6.	226.
128	1018.	2.	211.

129	1017.	0.	207.	
130	1016.	0.	204.	
131	1015.	0.	201.	
132	1014.	0.	199.	
133	1013.	0.	196.	
134	1013.	0.	193.	
135	1012.	0.	191.	
136	1011.	0.	188.	
137	1010.	0.	185.	
138	1009.	0.	183.	
139	1009.	0.	180.	
140	1008.	0.	178.	
141	1007.	0.	175.	
142	1007.	0.	173.	
143	1006.	0.	171.	
144	1005.	0.	168.	
145	1004.	0.	166.	
146	1004.	0.	164.	
147	1003.	0.	161.	
148	1002.	0.	159.	
149	1002.	0.	157.	
150	1001.	0.	155.	
SUM			23357.	

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	365.	193.	155.	155.	23357.
INCHES		4.49	4.52	4.52	4.52
AC-FT		95.	96.	96.	96.

RUNOFF SUMMARY, AVERAGE FLOW

		PEAK	6-HOUR	24-HOUR	72-HOUR	AREA
HYDROGRAPH AT	1	1189.	398.	319.	819.	0.40
ROUTED TO	1	365.	193.	155.	155.	0.40

****
HEC-1 VERSION DATED JAN 1973

****

DAM SAFETY INSPECTION - NEW JERSEY STATE
BEAR SWAMP LAKE DAMS 1 AND 2
PERCENT OF PMF FLOOD ROUTING

JOB SPECIFICATION

NQ	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
150	0	3	0	0	0	0	0	4	0

JOPER	NWT
3	0

********** ********** ********** ********** **********

SUB-AREA RUNOFF COMPUTATION

INPUT UNIT HYDROGRAPH DERIVED FROM SCS METHOD

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME
1	0	0	0	0	0	1

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
0	-1	0.40	0.00	0.40	0.00	0.340	0	0	0

LOSS DATA

STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

RECESSION DATA

STRTQ= 0.00 QRCSN= 0.00 RTIOR= 1.00

END-OF-PERIOD FLOW

TIME	RAIN	EXCS	COMP Q
SUM	17.61	17.61	9575S.

********** ********** ********** ********** **********

HYDROGRAPH ROUTING

ROUTE HYDROGRAPH THRU BEAR SWAMP DAMS 1 AND 2

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME
1	1	0	0	0	0	1

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME
0.0	0.000	0.00	1	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA
0	0	0	0.000	0.000	0.000	-1.

STORAGE=	900.	940.	980.	998.	1000.	1018.	1060.	1150.	1245.	1550.
OUTFLOW=	0.	40.	90.	135.	150.	210.	910.	2875.	5550.	8800.

********** ********** ********** ********** **********

RUNOFF SUMMARY: AVERAGE FLOW

		PEAK	6-HOUR	24-HOUR	72-HOUR	AREA
HYDROGRAPH AT	1	809.	271.	217.	217.	0.40
ROUTED TO	1	156.	95.	75.	75.	0.40

RESERVOIR

DRAWDOWN

COMPUTATIONS

BEAR SWAMP #1 & #2

ECI-4 ENGINEERING CONSULTANTS, INC.

DAM SAFETY INSPECTION - NEW JERSEY (STATE) SHEET NO. 1 OF ____

BEAR SWAMP DAM #2 JOB NO. 1211-001-1

RESERVOIR DRAW DOWN STUDY BY KLB DATE 3/17-78

a) DISCHARGE VS. HEAD

$Q = 0.49\ A\ \sqrt{2gH} = 1.20\sqrt{H}$ BEAR SWAMP #1

$Q = 0.572\ A\ \sqrt{2gH} = 3.61\sqrt{H}$ BEAR SWAMP #2

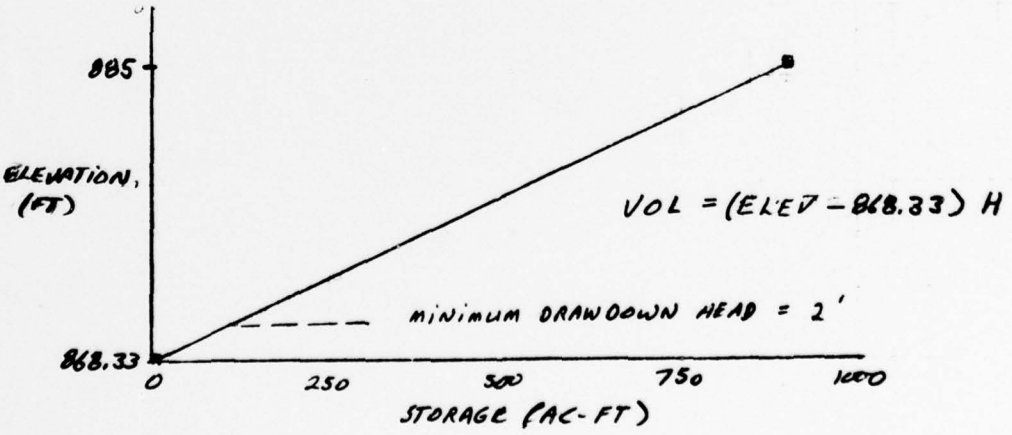
SEE NOTES FOR OUTLET RATING CURVES

b) STORAGE VS. HEAD

ASSUME A STRAIGHT LINE RELATIONSHIP.

FROM NORMAL WATER SURFACE VOLUME
TO ZERO VOLUME AT ZERO HEAD

	ELEV (FT)	HEAD (FT)	STORAGE (AC-FT)
NWS.	885	16.67	900
	868.33	0	0

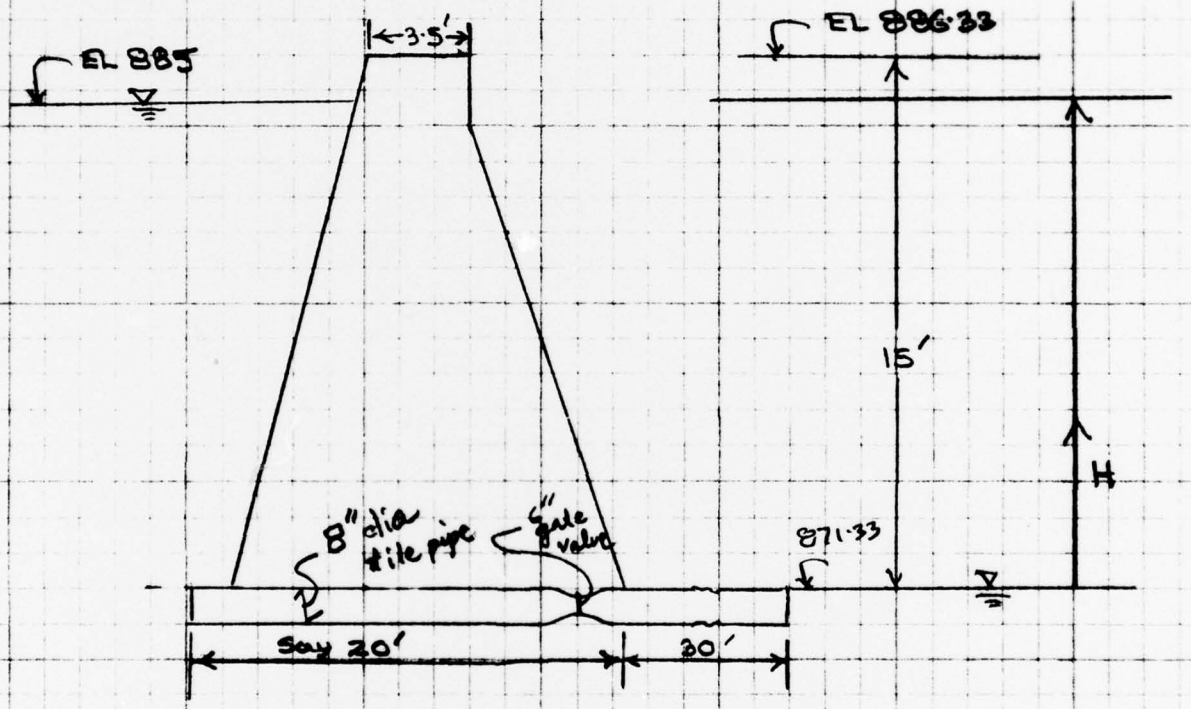


c) INFLOW; DRAINAGE AREA = 0.4 SQ. MI.

INFLOW = 2 CFS/SQ. MI. × 0.4 SQ. MI = 0.8 CFS.

BEAR SWAMP LAKE DAM #1

OUTLET RATING CURVE



Note: All the dimensions and invert elevations are assumed numbers, these figures may be far off from actual dimensions and elevations.

Outlet Discharges:

Assume: $\begin{cases} K_e = 0.5, \; K_{valve} = 0.19 \\ \epsilon = 0.01 \text{ ft} \; \& \text{ Complete turbulence} \end{cases}$

$$\therefore H = \left[K_e + K_{valve}\left(\frac{d_2}{d_1}\right)^4 + \frac{fL}{d_2} + 1 \right] \frac{V^2}{2g} \; ; \quad \begin{matrix} d_2 = 8'' \\ d_1 = 6'' \end{matrix}$$

$$\frac{\epsilon}{d_2} = \frac{0.01}{8/12} = 0.015 \Rightarrow f = 0.044$$

$$\therefore H = \left[0.5 + 0.19\left(\frac{8}{6}\right)^4 + \frac{0.044 \times 50}{8/12} + 1\right] \frac{V^2}{2g}$$

$$= \left[0.5 + 0.60 + 3.30 + 1\right] \frac{V^2}{2g}$$

$$= 5.40 \frac{V^2}{2g}$$

$$\therefore V = 0.43\sqrt{2gH}$$

$$\therefore Q = 0.43 A \sqrt{2gH}$$

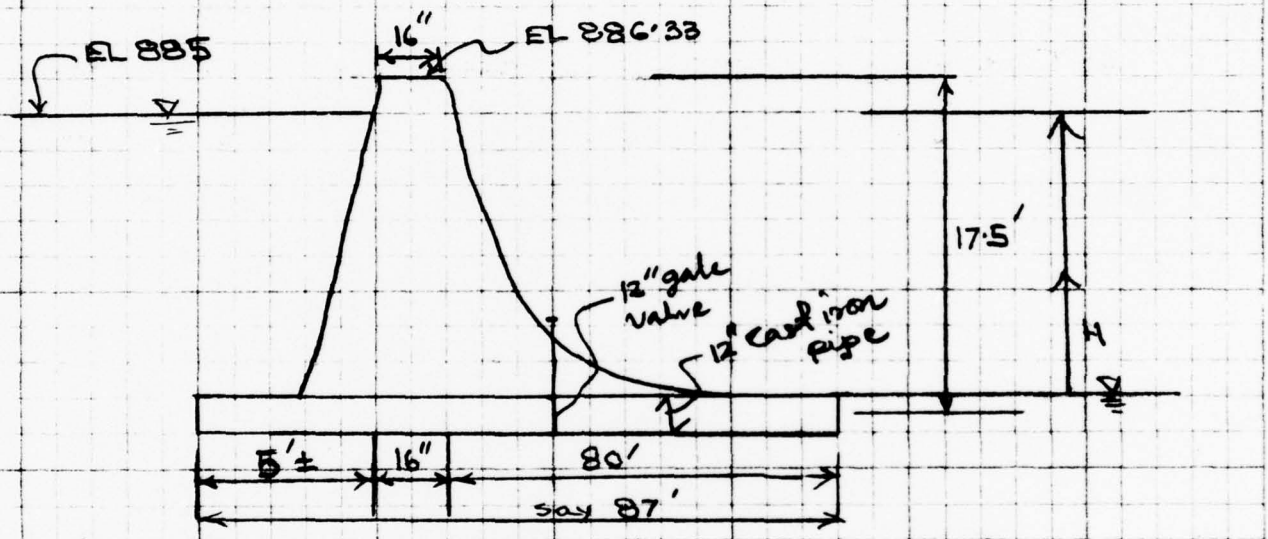
ECI-4 **ENGINEERING CONSULTANTS, INC.**

DAM SAFETY INSPECTION - NEW JERSEY STATE SHEET NO. 3 OF
BEAR SWAMP LAKE DAM #1 JOB NO. 1217-001-1
OUTLET RATING CURVE BY KLB DATE 9-20-78

RESERVOIR POOL ELEVATION (FT)	HEAD H (FT)	DISCHARGE $Q = 0.43A\sqrt{2gH} = 1.20\sqrt{H}$	REMARKS
871.33	0	0	
872.33	1	1.20	
873.33	2	1.70	
874.33	3	2.08	
875.33	4	2.40	
876.33	5	2.68	
877.33	6	2.94	
878.33	7	3.17	
879.33	8	3.39	
880.33	9	3.60	
881.33	10	3.79	
882.33	11	3.98	
883.33	12	4.16	
885.00	13.67	4.44	SPILLWAY CREST EL.

BEAR SWAMP LAKE DAM #2

OUTLET RATING CURVE



Note: All the dimensions are assumed dimension they may be far off from actual dimensions.

Outlet Discharges:

Assume: $K_e = 0.5$, $K_{valve} = 0.19$ (fully open)
$\epsilon = 0.00085$, and complete turbulence

$\frac{\epsilon}{D} = 0.00085 \Rightarrow f = 0.0158$ (rough pipe, complete turbulence)

$$H = \left(K_e + K_{valve} + \frac{fL}{D} + 1\right)\frac{V^2}{2g}$$

$$= \left(0.5 + 0.19 + \frac{0.0158 \times 87}{1} + 1\right)\frac{V^2}{2g}$$

$$= 3.06\,\frac{V^2}{2g}$$

C1-4 ENGINEERING CONSULTANTS, INC.

DAM SAFETY INSPECTION / NEW JERSEY STATE SHEET NO. 2 OF
BEAR SWAMP LAKE DAM #2 JOB NO. 1211-001
OUTLET RATING CURVE BY MAS DATE 9/19/78

$\therefore V = 0.572\sqrt{2gH}$

$\therefore Q = 0.572 A\sqrt{2gH}$

Upstream Water Surface elev. (ft)	Downstream Water Surface elev. (ft)	Head H, (ft)	Discharge, $Q = 0.572A\sqrt{2gH} = 3.61\sqrt{H}$ cfs	Remarks
870.33	869.33	1	3.61	
871.33	869.33	2	5.11	ZERO HEAD FOR OUTLET #1
872.33	869.33	3	6.25	
873.33	869.33	4	7.22	
874.33	869.33	5	8.07	
875.33	869.33	6	8.84	
876.33	869.33	7	9.55	
877.33	869.33	8	10.21	
878.33	869.33	9	10.83	
879.33	869.33	10	11.42	
880.33	869.33	11	11.97	
881.33	869.33	12	12.51	
882.33	869.33	13	13.02	
883.33	869.33	14	13.51	
885	869.33	15.67	14.29	SPILLWAY CREST EL.

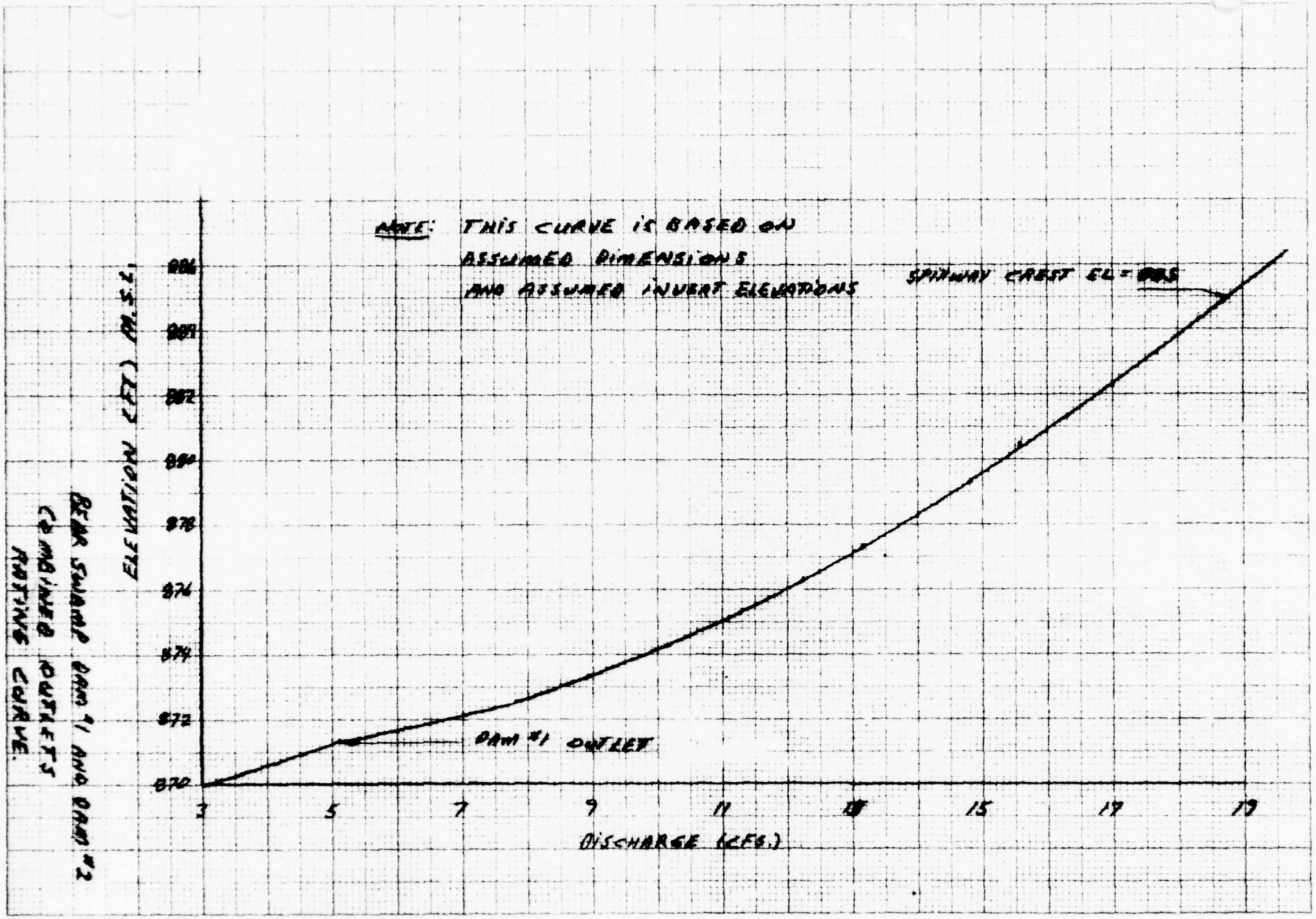
ECI-4 ENGINEERING CONSULTANTS, INC.

DAM SAFETY INSPECTION - NEW JERSEY (STATE) SHEET NO. 1 OF ____

BEAR SWAMP DAM #1 AND #2 JOB NO. 124

COMBINED OUTLET RATING CURVE BY KLB DATE 9-20-78

BEAR SWAMP LAKE ELEVATION (FT)	DAM #1 OUTLET DISCHARGE (CFS)	DAM #2 OUTLET DISCHARGE (CFS)	COMBINED OUTLETS DISCHARGE (CFS)	REMARKS
870.33	—	3.61	3.61	
871.33	0	5.11	5.11	
872.33	1.20	6.25	7.45	
873.33	1.70	7.22	8.92	
874.33	2.08	8.07	10.15	
875.33	2.40	8.84	11.24	
876.33	2.68	9.55	12.23	
877.33	2.94	10.21	13.15	
878.33	3.17	10.83	14.00	
879.33	3.39	11.42	14.81	
880.33	3.60	11.97	15.57	
881.33	3.79	12.51	16.30	
882.33	3.98	13.02	17.00	
883.33	4.16	13.51	17.67	
885.00	4.44	14.29	18.73	SPILLWAY CREST EL.


NOTE: THIS CURVE IS BASED ON ASSUMED DIMENSIONS AND ASSUMED INVERT ELEVATIONS
SPILLWAY CREST EL = [illegible]
DAM #1 OUTLET
ELEVATION (FT.) MSL
DISCHARGE (CFS.)
870
872
874
876
878
880
882
884
3
5
7
9
11
13
15
17
19
REAR SQUARE DAM #1 AND DAM #2 COMBINED OUTLETS RATING CURVE.

FLOOD ROUTING STUDY
****

BEAR SWAMP LAKE DAM 1 AND DAM 2 DRAWDOWN STUDY (DA = 0.4 SQ. MI.)

MAXIMUM OPERATION LEVEL AT ELEV 485.00 FT (FROM OPERATI
MINIMUM OPERATION LEVEL AT ELEV 470.33 FT

ROUTING STARTS AT ELEV 485.00 FT. ENDS AT ELEV 470.33 FT

TIME		AVG.INFLOW	RESERVOIR EL	MAIN SPILLWAY DISCHARGE	OVERFLOW SPILLWAY DISCHARGE	OUTLET DISCHARGE
DAY	HR	CFS	FT	CFS	CFS	CFS
0	0		485.00			
		0.				
0	6		484.82	0.	0.	19.
		0.				
0	12		484.64	0.	0.	19.
		0.				
0	18		484.47	0.	0.	18.
		0.				
1	0		484.29	0.	0.	18.
		0.				
1	6		484.11	0.	0.	18.
		0.				
1	12		483.94	0.	0.	18.
		0.				
1	18		483.77	0.	0.	18.
		0.				
2	0		483.60	0.	0.	18.
		0.				
2	6		483.42	0.	0.	18.
		0.				
2	12		483.25	0.	0.	18.
		0.				
2	18		483.09	0.	0.	18.
		0.				
3	0		482.92	0.	0.	17.
		0.				
3	6		482.75	0.	0.	17.
		0.				
3	12		482.59	0.	0.	17.
		0.				
3	18		482.42	0.	0.	17.
		0.				
4	0		482.26	0.	0.	17.
		0.				
4	6		482.10	0.	0.	17.

FLOOD ROUTING STUDY
****

TIME		AVG. INFLOW	RESERVOIR CL	MAIN SPILLWAY DISCHARGE	OVERFLOW SPILLWAY DISCHARGE	OUTLET DISCHARGE
DAY	HR	CFS	FT	CFS	CFS	CFS
		0.				
4	12		481.94	0.	0.	17.
		0.				
4	18		481.78	0.	0.	17.
		0.				
5	0		481.62	0.	0.	17.
		0.				
5	6		481.46	0.	0.	16.
		0.				
5	12		481.30	0.	0.	16.
		0.				
5	18		481.15	0.	0.	16.
		0.				
6	0		480.99	0.	0.	16.
		0.				
6	6		480.84	0.	0.	16.
		0.				
6	12		480.69	0.	0.	16.
		0.				
6	18		480.53	0.	0.	16.
		0.				
7	0		480.38	0.	0.	16.
		0.				
7	6		480.23	0.	0.	15.
		0.				
7	12		480.09	0.	0.	15.
		0.				
7	18		479.94	0.	0.	15.
		0.				
8	0		479.79	0.	0.	15.
		0.				
8	6		479.65	0.	0.	15.
		0.				
8	12		479.50	0.	0.	15.
		0.				
8	18		479.36	0.	0.	15.
		0.				
9	0		479.22	0.	0.	15.
		0.				
9	6		479.08	0.	0.	15.
		0.				
9	12		478.94	0.	0.	14.
		0.				
9	18		478.80	0.	0.	14.
		0.				
10	0		478.66	0.	0.	14.

FLOOD ROUTING STUDY
****

TIME		AVG. INFLOW	RESERVOIR EL	MAIN SPILLWAY DISCHARGE	OVERFLOW SPILLWAY DISCHARGE	OUTLET DISCHARGE
DAY	HR	CFS	FT	CFS	CFS	CFS
		0.				
10	6		478.52	0.	0.	14.
		0.				
10	12		478.39	0.	0.	14.
		0.				
10	18		478.25	0.	0.	14.
		0.				
11	0		478.12	0.	0.	14.
		0.				
11	6		477.99	0.	0.	14.
		0.				
11	12		477.86	0.	0.	14.
		0.				
11	18		477.73	0.	0.	13.
		0.				
12	0		477.60	0.	0.	13.
		0.				
12	6		477.47	0.	0.	13.
		0.				
12	12		477.34	0.	0.	13.
		0.				
12	18		477.22	0.	0.	13.
		0.				
13	0		477.09	0.	0.	13.
		0.				
13	6		476.97	0.	0.	13.
		0.				
13	12		476.85	0.	0.	13.
		0.				
13	18		476.73	0.	0.	13.
		0.				
14	0		476.61	0.	0.	12.
		0.				
14	6		476.49	0.	0.	12.
		0.				
14	12		476.37	0.	0.	12.
		0.				
14	18		476.25	0.	0.	12.
		0.				
15	0		476.13	0.	0.	12.
		0.				
15	6		476.02	0.	0.	12.
		0.				
15	12		475.90	0.	0.	12.
		0.				
15	18		475.79	0.	0.	12.

TIME		AVG.INFLOW	RESERVOIR EL	MAIN SPILLWAY DISCHARGE	OVERFLOW SPILLWAY DISCHARGE	OUTLET DISCHARGE
DAY	HR	CFS	FT	CFS	CFS	CFS
		0.				
16	0		475.68	0.	0.	12.
		0.				
16	6		475.57	0.	0.	11.
		0.				
16	12		475.46	0.	0.	11.
		0.				
16	18		475.35	0.	0.	11.
		0.				
17	0		475.24	0.	0.	11.
		0.				
17	6		475.14	0.	0.	11.
		0.				
17	12		475.03	0.	0.	11.
		0.				
17	18		474.93	0.	0.	11.
		0.				
18	0		474.82	0.	0.	11.
		0.				
18	6		474.72	0.	0.	11.
		0.				
18	12		474.62	0.	0.	10.
		0.				
18	18		474.52	0.	0.	10.
		0.				
19	0		474.42	0.	0.	10.
		0.				
19	6		474.32	0.	0.	10.
		0.				
19	12		474.23	0.	0.	10.
		0.				
19	18		474.13	0.	0.	10.
		0.				
20	0		474.04	0.	0.	10.
		0.				
20	6		473.94	0.	0.	10.
		0.				
20	12		473.85	0.	0.	10.
		0.				
20	18		473.76	0.	0.	9.
		0.				
21	0		473.67	0.	0.	9.
		0.				
21	6		473.58	0.	0.	9.
		0.				
21	12		473.49	0.	0.	9.

TIME		AVG. INFLOW	RESERVOIR EL	MAIN SPILLWAY DISCHARGE	OVERFLOW SPILLWAY DISCHARGE	OUTLET DISCHARGE
DAY	HR	CFS	FT	CFS	CFS	CFS
		0.				
21	18		473.40	0.	0.	9.
		0.				
22	0		473.32	0.	0.	9.
		0.				
22	6		473.23	0.	0.	9.
		0.				
22	12		473.15	0.	0.	9.
		0.				
22	18		473.06	0.	0.	9.
		0.				
23	0		472.98	0.	0.	9.
		0.				
23	6		472.90	0.	0.	8.
		0.				
23	12		472.82	0.	0.	8.
		0.				
23	18		472.74	0.	0.	8.
		0.				
24	0		472.66	0.	0.	8.
		0.				
24	6		472.59	0.	0.	8.
		0.				
24	12		472.51	0.	0.	8.
		0.				
24	18		472.44	0.	0.	8.
		0.				
25	0		472.37	0.	0.	8.
		0.				
25	6		472.29	0.	0.	7.
		0.				
25	12		472.22	0.	0.	7.
		0.				
25	18		472.16	0.	0.	7.
		0.				
26	0		472.09	0.	0.	7.
		0.				
26	6		472.03	0.	0.	7.
		0.				
26	12		471.96	0.	0.	6.
		0.				
26	18		471.90	0.	0.	6.
		0.				
27	0		471.84	0.	0.	6.
		0.				
7	6		471.78	0.	0.	6.

FLOOD ROUTING STUDY
****

TIME		AVG. INFLOW	RESERVOIR EL	MAIN SPILLWAY DISCHARGE	OVERFLOW SPILLWAY DISCHARGE	OUTLET DISCHARGE
DAY	HR	CFS	FT	CFS	CFS	CFS
		0.				
27	12		471.72	0.	0.	6.
		0.				
27	18		471.67	0.	0.	6.
		0.				
28	0		471.61	0.	0.	6.
		0.				
28	6		471.56	0.	0.	6.
		0.				
28	12		471.51	0.	0.	5.
		0.				
28	18		471.45	0.	0.	5.
		0.				
29	0		471.40	0.	0.	5.
		0.				
29	6		471.35	0.	0.	5.
		0.				
29	12		471.30	0.	0.	5.
		0.				
29	18		471.26	0.	0.	5.
		0.				
30	0		471.21	0.	0.	5.
		0.				
30	6		471.16	0.	0.	5.
		0.				
30	12		471.12	0.	0.	5.
		0.				
30	18		471.07	0.	0.	5.
		0.				
31	0		471.03	0.	0.	5.
		0.				
31	6		470.98	0.	0.	4.
		0.				
31	12		470.94	0.	0.	4.
		0.				
31	18		470.90	0.	0.	4.
		0.				
32	0		470.86	0.	0.	4.
		0.				
32	6		470.82	0.	0.	4.
		0.				
32	12		470.78	0.	0.	4.
		0.				
32	18		470.74	0.	0.	4.
		0.				
33	0		470.70	0.	0.	4.

FLOOD ROUTING STUDY
****

TIME		AVG.INFLOW	RESERVOIR EL	MAIN SPILLWAY DISCHARGE	OVERFLOW SPILLWAY DISCHARGE	OUTLET DISCHARGE
DAY	HR	CFS	FT	CFS	CFS	CFS
33	6	0.	470.66	0.	0.	4.
33	12	0.	470.62	0.	0.	4.
33	18	0.	470.58	0.	0.	4.
34	0	0.	470.54	0.	0.	4.
34	6	0.	470.51	0.	0.	4.
34	12	0.	470.47	0.	0.	4.
34	18	0.	470.43	0.	0.	4.
35	0	0.	470.40	0.	0.	4.
35	6	0.	470.36	0.	0.	4.

****

RESERVOIR ELEVATION WENT UNDER MINIMUM WATERSURFACE ELEVATION
AFTER 35 DAYS AND 6 HOURS.

TOTAL INFLOW VOLUME	0.	ACFT
TOTAL DISCHARGE VOLUME	790.	ACFT
MAXIMUM WATER SURFACE ELEVATION	485.00	FT
MAXIMUM DISCHARGE THRU OUTLET	19.	CFS
MAXIMUM TOTAL INFLOW	0.	CFS
MAXIMUM TOTAL DISCHARGE	19.	CFS

FLOOD ROUTING STUDY
****

BEAR SWAMP LAKE DAM 1 AND DAM 2 DRAWDOWN STUDY (DA = 0.4 SQ. MI.)

MAXIMUM OPERATION LEVEL AT ELEV 485.00 FT (FROM OPERAT:
MINIMUM OPERATION LEVEL AT ELEV 470.33 FT

ROUTING STARTS AT ELEV 485.00 FT. ENDS AT ELEV 470.33 FT

TIME		AVG. INFLOW	RESERVOIR EL	MAIN SPILLWAY DISCHARGE	OVERFLOW SPILLWAY DISCHARGE	OUTLET DISCHARGE
DAY	HR	CFS	FT	CFS	CFS	CFS
0	0		485.00			
		1.				
0	6		484.83	0.	0.	19.
		1.				
0	12		484.66	0.	0.	19.
		1.				
0	18		484.49	0.	0.	18.
		1.				
1	0		484.32	0.	0.	18.
		1.				
1	6		484.15	0.	0.	18.
		1.				
1	12		483.99	0.	0.	18.
		1.				
1	18		483.82	0.	0.	18.
		1.				
2	0		483.66	0.	0.	18.
		1.				
2	6		483.49	0.	0.	18.
		1.				
2	12		483.33	0.	0.	18.
		1.				
2	18		483.17	0.	0.	18.
		1.				
3	0		483.01	0.	0.	17.
		1.				
3	6		482.85	0.	0.	17.
		1.				
3	12		482.69	0.	0.	17.
		1.				
3	18		482.53	0.	0.	17.
		1.				
4	0		482.38	0.	0.	17.
		1.				
4	6		482.22	0.	0.	17.

FLOOD ROUTING STUDY
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TIME		AVG. INFLOW	RESERVOIR EL	MAIN SPILLWAY DISCHARGE	OVERFLOW SPILLWAY DISCHARGE	OUTLET DISCHARGE
DAY	HR	CFS	FT	CFS	CFS	CFS
4	12	1.	482.07	0.	0.	17.
4	18	1.	481.91	0.	0.	17.
5	0	1.	481.76	0.	0.	17.
5	6	1.	481.61	0.	0.	16.
5	12	1.	481.46	0.	0.	16.
5	18	1.	481.31	0.	0.	16.
6	0	1.	481.16	0.	0.	16.
6	6	1.	481.01	0.	0.	16.
6	12	1.	480.87	0.	0.	16.
6	18	1.	480.72	0.	0.	16.
7	0	1.	480.58	0.	0.	16.
7	6	1.	480.44	0.	0.	16.
7	12	1.	480.29	0.	0.	16.
7	18	1.	480.15	0.	0.	15.
8	0	1.	480.01	0.	0.	15.
8	6	1.	479.87	0.	0.	15.
8	12	1.	479.74	0.	0.	15.
8	18	1.	479.60	0.	0.	15.
9	0	1.	479.46	0.	0.	15.
9	6	1.	479.33	0.	0.	15.
9	12	1.	479.19	0.	0.	15.
9	18	1.	479.06	0.	0.	15.
10	0	1.	478.93	0.	0.	14.

FLOOD ROUTING STUDY
****

TIME		AVG. INFLOW	RESERVOIR EL	MAIN SPILLWAY DISCHARGE	OVERFLOW SPILLWAY DISCHARGE	OUTLET DISCHARGE
DAY	HR	CFS	FT	CFS	CFS	CFS
		1.				
10	6		478.80	0.	0.	14.
		1.				
10	12		478.67	0.	0.	14.
		1.				
10	18		478.54	0.	0.	14.
		1.				
11	0		478.41	0.	0.	14.
		1.				
11	6		478.28	0.	0.	14.
		1.				
11	12		478.16	0.	0.	14.
		1.				
11	18		478.03	0.	0.	14.
		1.				
12	0		477.91	0.	0.	14.
		1.				
12	6		477.79	0.	0.	14.
		1.				
12	12		477.66	0.	0.	13.
		1.				
12	18		477.54	0.	0.	13.
		1.				
13	0		477.42	0.	0.	13.
		1.				
13	6		477.31	0.	0.	13.
		1.				
13	12		477.19	0.	0.	13.
		1.				
13	18		477.07	0.	0.	13.
		1.				
14	0		476.95	0.	0.	13.
		1.				
14	6		476.84	0.	0.	13.
		1.				
14	12		476.73	0.	0.	13.
		1.				
14	18		476.61	0.	0.	12.
		1.				
15	0		476.50	0.	0.	12.
		1.				
15	6		476.39	0.	0.	12.
		1.				
15	12		476.28	0.	0.	12.
		1.				
15	18		476.17	0.	0.	12.

FLOOD ROUTING STUDY
****

TIME		AVG. INFLOW	RESERVOIR EL	MAIN SPILLWAY DISCHARGE	OVERFLOW SPILLWAY DISCHARGE	OUTLET DISCHARGE
DAY	HR	CFS	FT	CFS	CFS	CFS
		1.				
16	0		476.06	0.	0.	12.
		1.				
16	6		475.96	0.	0.	12.
		1.				
16	12		475.85	0.	0.	12.
		1.				
16	18		475.75	0.	0.	12.
		1.				
17	0		475.64	0.	0.	12.
		1.				
17	6		475.54	0.	0.	11.
		1.				
17	12		475.44	0.	0.	11.
		1.				
17	18		475.34	0.	0.	11.
		1.				
18	0		475.24	0.	0.	11.
		1.				
18	6		475.14	0.	0.	11.
		1.				
18	12		475.04	0.	0.	11.
		1.				
18	18		474.94	0.	0.	11.
		1.				
19	0		474.85	0.	0.	11.
		1.				
19	6		474.75	0.	0.	11.
		1.				
19	12		474.66	0.	0.	11.
		1.				
19	18		474.57	0.	0.	10.
		1.				
20	0		474.47	0.	0.	10.
		1.				
20	6		474.38	0.	0.	10.
		1.				
20	12		474.29	0.	0.	10.
		1.				
20	18		474.20	0.	0.	10.
		1.				
21	0		474.12	0.	0.	10.
		1.				
21	6		474.03	0.	0.	10.
21	12	1.	473.94	0.	0.	10.

FLOOD ROUTING STUDY
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TIME		AVG. INFLOW	RESERVOIR EL	MAIN SPILLWAY DISCHARGE	OVERFLOW SPILLWAY DISCHARGE	OUTLET DISCHARGE
DAY	HR	CFS	FT	CFS	CFS	CFS
		1.				
21	18		473.86	0.	0.	10.
		1.				
22	0		473.77	0.	0.	9.
		1.				
22	6		473.69	0.	0.	9.
		1.				
22	12		473.61	0.	0.	9.
		1.				
22	18		473.53	0.	0.	9.
		1.				
23	0		473.45	0.	0.	9.
		1.				
23	6		473.37	0.	0.	9.
		1.				
23	12		473.29	0.	0.	9.
		1.				
23	18		473.21	0.	0.	9.
		1.				
24	0		473.14	0.	0.	9.
		1.				
24	6		473.06	0.	0.	9.
		1.				
24	12		472.99	0.	0.	9.
		1.				
24	18		472.91	0.	0.	8.
		1.				
25	0		472.84	0.	0.	8.
		1.				
25	6		472.77	0.	0.	8.
		1.				
25	12		472.70	0.	0.	8.
		1.				
25	18		472.63	0.	0.	8.
		1.				
26	0		472.56	0.	0.	8.
		1.				
26	6		472.49	0.	0.	8.
		1.				
26	12		472.43	0.	0.	8.
		1.				
26	18		472.36	0.	0.	8.
		1.				
27	0		472.30	0.	0.	7.
		1.				
27	6		472.24	0.	0.	7.

FLOOD ROUTING STUDY
****

TIME		AVG. INFLOW	RESERVOIR EL	MAIN SPILLWAY DISCHARGE	OVERFLOW SPILLWAY DISCHARGE	OUTLET DISCHARGE
DAY	HR	CFS	FT	CFS	CFS	CFS
		1.				
27	12		472.18	0.	0.	7.
		1.				
27	18		472.12	0.	0.	7.
		1.				
28	0		472.06	0.	0.	7.
		1.				
28	6		472.00	0.	0.	7.
		1.				
28	12		471.95	0.	0.	6.
		1.				
28	18		471.89	0.	0.	6.
		1.				
29	0		471.84	0.	0.	6.
		1.				
29	6		471.79	0.	0.	6.
		1.				
29	12		471.74	0.	0.	6.
		1.				
29	18		471.69	0.	0.	6.
		1.				
30	0		471.64	0.	0.	6.
		1.				
30	6		471.60	0.	0.	6.
		1.				
30	12		471.55	0.	0.	6.
		1.				
30	18		471.51	0.	0.	5.
		1.				
31	0		471.46	0.	0.	5.
		1.				
31	6		471.42	0.	0.	5.
		1.				
31	12		471.37	0.	0.	5.
		1.				
31	18		471.33	0.	0.	5.
		1.				
32	0		471.29	0.	0.	5.
		1.				
32	6		471.25	0.	0.	5.
		1.				
32	12		471.21	0.	0.	5.
		1.				
32	18		471.17	0.	0.	5.
		1.				
33	0		471.13	0.	0.	5.

TIME		AVG. INFLOW	RESERVOIR EL	MAIN SPILLWAY DISCHARGE	OVERFLOW SPILLWAY DISCHARGE	OUTLET DISCHARGE
DAY	HR	CFS	FT	CFS	CFS	CFS
33	6	1.	471.10	0.	0.	5.
33	12	1.	471.06	0.	0.	5.
33	18	1.	471.02	0.	0.	5.
34	0	1.	470.99	0.	0.	5.
34	6	1.	470.95	0.	0.	4.
34	12	1.	470.92	0.	0.	4.
34	18	1.	470.88	0.	0.	4.
35	0	1.	470.85	0.	0.	4.
35	6	1.	470.82	0.	0.	4.
35	12	1.	470.78	0.	0.	4.
35	18	1.	470.75	0.	0.	4.
36	0	1.	470.72	0.	0.	4.
36	6	1.	470.69	0.	0.	4.
36	12	1.	470.66	0.	0.	4.
36	18	1.	470.63	0.	0.	4.
37	0	1.	470.60	0.	0.	4.
37	6	1.	470.57	0.	0.	4.
37	12	1.	470.54	0.	0.	4.
37	18	1.	470.51	0.	0.	4.
38	0	1.	470.48	0.	0.	4.
38	6	1.	470.45	0.	0.	4.
38	12	1.	470.42	0.	0.	4.
38	18	1.	470.39	0.	0.	4.

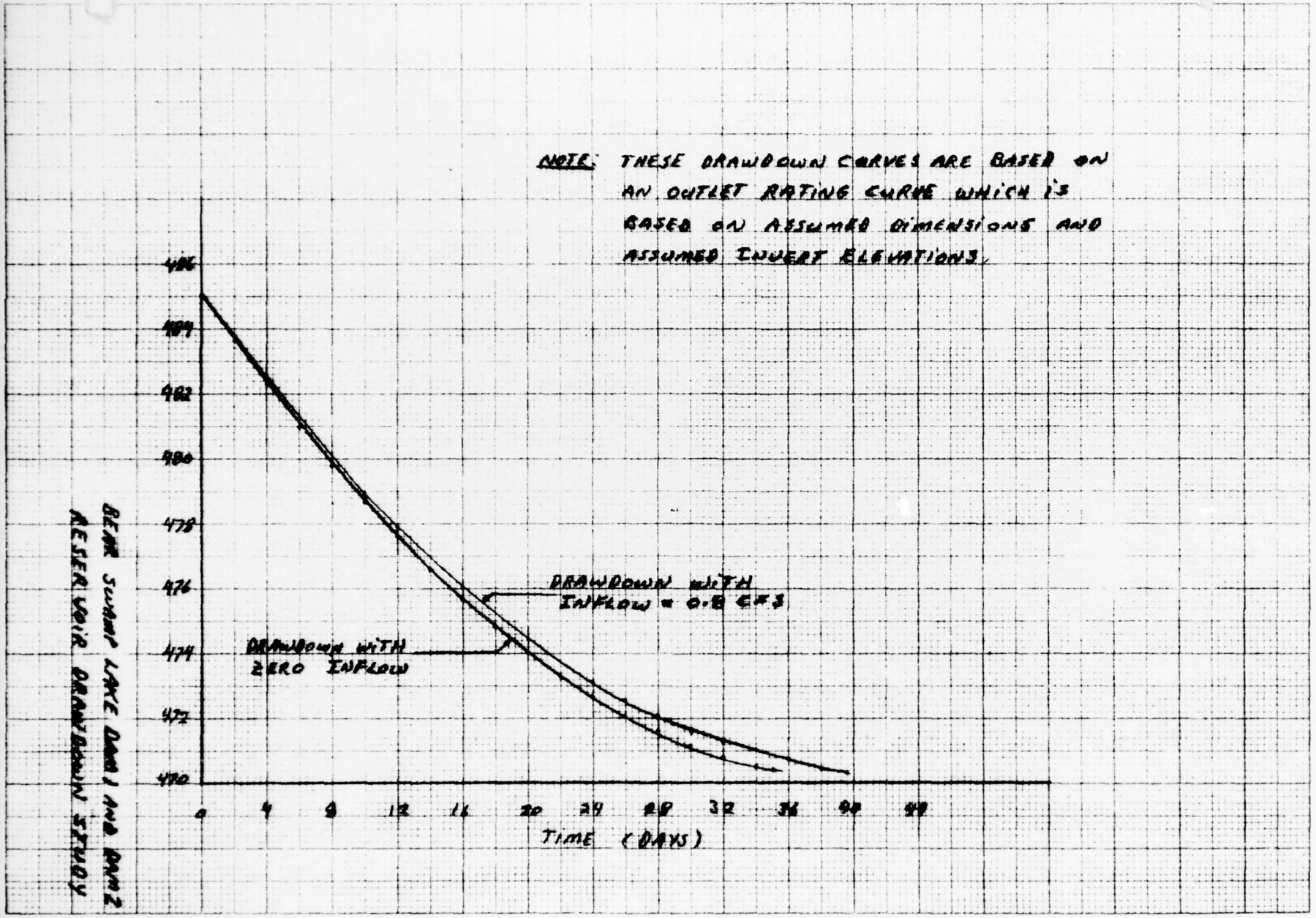
FLOOD ROUTING STUDY
****

TIME		AVG. INFLOW	RESERVOIR EL	MAIN SPILLWAY DISCHARGE	OVERFLOW SPILLWAY DISCHARGE	OUTLET DISCHARGE
DAY	HR	CFS	FT	CFS	CFS	CFS
39	0	1.	470.37	0.	0.	4.
39	6	1.	470.34	0.	0.	4.

****

RESERVOIR ELEVATION WENT UNDER MINIMUM WATERSURFACE ELEVATION
AFTER 39 DAYS AND 6 HOURS

TOTAL INFLOW VOLUME	65.	ACFT
TOTAL DISCHARGE VOLUME	857.	ACFT
MAXIMUM WATER SURFACE ELEVATION	485.00	FT
MAXIMUM DISCHARGE THRU OUTLET	19.	CFS
MAXIMUM TOTAL INFLOW	1.	CFS
MAXIMUM TOTAL DISCHARGE	19.	CFS


NOTE: THESE DRAWDOWN CURVES ARE BASED ON AN OUTLET RATING CURVE WHICH IS BASED ON ASSUMED DIMENSIONS AND ASSUMED INVERT ELEVATIONS.
DRAWDOWN WITH INFLOW = 0.8 CFS
DRAWDOWN WITH ZERO INFLOW
BEAR SWAMP LAKE DAM I AND DAM 2
AESER VOIR DRAWDOWN STUDY
TIME (DAYS)

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number)
This report cites results of a technical investigation as to the dam's adequacy. The inspection and evaluation of the dam is as prescribed by the National Dam Inspection Act, Public Law 92-367. The technical investigation includes visual inspection, review of available design and construction records, and preliminary structural and hydraulic and hydrologic calculations, as applicable. An assessment of the dam's general condition is included in the report.

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